Missoula Urban Transportation District (Mountain Line)
2018 Strategic Plan

Adopted by the Board of Directors August 23, 2018

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Let's think about transit

DJ&A, P.C.

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Executive Summary

Introduction

Public transit benefits us all in Missoula by reducing parking and traffic congestion, improving air quality, and increasing mobility. Mountain Line helps employees get to work, students get to school, and keeps seniors and people with disabilities active, mobile, and independent.

Mountain Line's 2012 Long Range Transit Plan laid out a phased blueprint of how to grow and improve public transit in the community. It called for additional bus service that was frequent and operated more hours of the day. In response, Mountain Line introduced its first BOLT! route, a schedule-free route operating every 15 minutes, in 2013. The community overwhelmingly approved funding for a second BOLT! route, longer hours of service, and enhanced Paratransit service for seniors and people with disabilities that started in 2015. At the same time, Zero-Fare service, funded by community partners, was implemented. This resulted in ridership growing from 900,000 to 1.5 million.

During this time the needs of the community also changed due to economic recovery, population increase, development, and how and where people travelled across Missoula. The time is right to update the 2012 LRTP to adjust the goals of Mountain Line to align with these changes. As Mountain Line celebrates 40 years of service to the Missoula community, we are excited to share our 2018 Strategic Plan.

Vision

Mountain Line's 2018 Strategic Plan is the result of a year-long effort to understand the views and desires of the community on how to grow its transit network, and the role transit should play in the region's growth. It replaces the 2012 Long Range Transit Plan as the guiding policy document for the agency. The plan aims to balance three key principles – improving service, informing future development, and using limited fiscal resources responsibly.

The result is a guiding document to create a transit system more Missoulians can use for all aspects of their lives. In doing so, Mountain Line will help to facilitate regional growth that is more sustainable, compact, and affordable. At the same time, this plan is careful and deliberate to maintain Mountain Line's successful record of fiscal health and responsibility.

The key elements of this plan are:

- Creating a livable transit system for Missoula
    - Aligning service with the Our Missoula Growth Policy
    - Developing a robust transit system to support the community vision
- High frequency service
    - Convenient routes that are schedule-free
- Expanded hours of service
    - Meeting the daily needs of more people
- Accessible to all
    - Continuing the Zero-Fare program
    - Providing excellent Paratransit service

Recent History

In 2012, Mountain Line consulted the Missoula community on how to grow its transit network. The overwhelming response was in support of a "Focus Inward" strategy, in which the most useful transit services were targeted where the most people live and work. This strategy became the basis for the 2012 Long Range Transit Plan. The 2012 Plan presented a 5-Phase blueprint of service enhancements. It featured two main types of improvements: higher frequencies of service and longer spans of service. By focusing such investments within the developed, urban parts of the service area, Mountain Line aimed to serve the greatest number of people.

Phase 1 of the 2012 Long Range Transit Plan was implemented in 2013 with the addition of high frequency BOLT! service to Route 1, which had the highest ridership in the system. This was followed by Phase 2 in 2015, which added high frequency BOLT! service to Route 2, in addition to later night service on the four most popular routes.

Also in 2015, a group of public and private partners came together to fund a three-year Zero-Fare demonstration project, making transit free and accessible to everyone. Financial contributions from these community partners were necessary to replace the small, but real, amount of revenue from fares. This project was not a recommendation of the 2012 Long Range Transit Plan, but was created to help Mountain Line improve the lives of all Missoula residents.

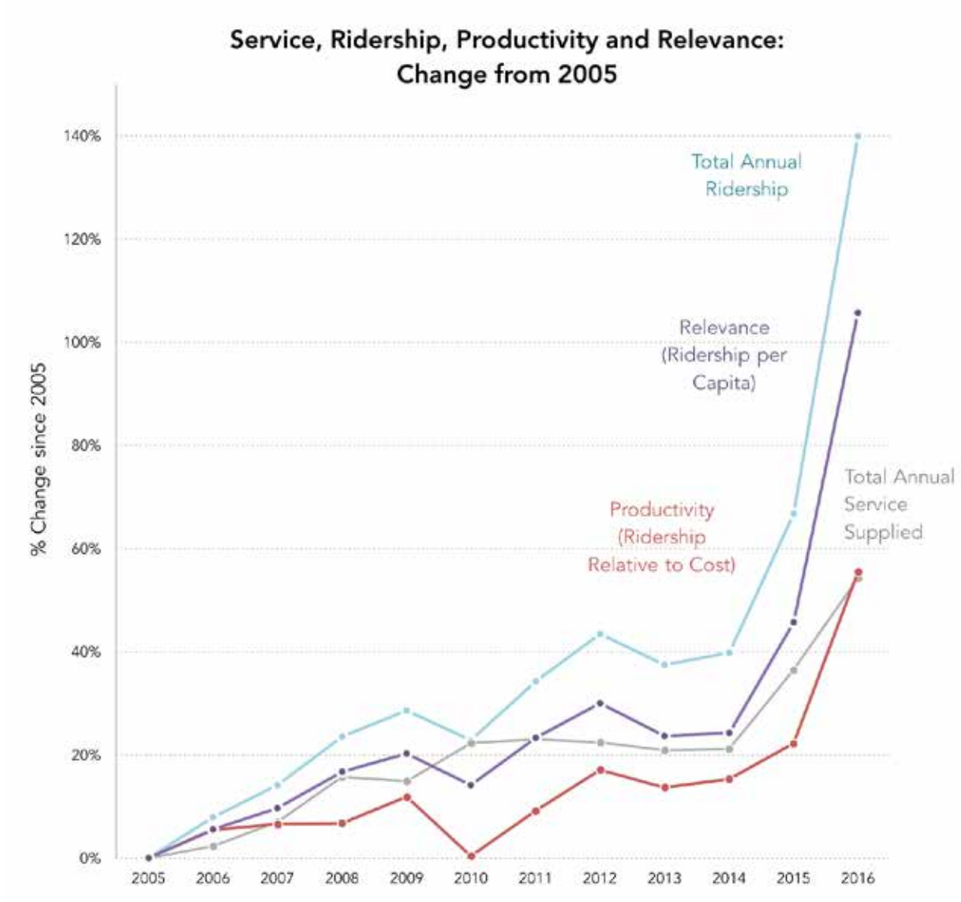


Figure 1: Missoula is one of few U.S. cities with growing transit ridership since 2010.

Current Success

Mountain Line's recent efforts have been a resounding success. At a time when most cities nationwide have been seeing a decline in transit ridership, Mountain Line has been succeeding by many measures. Fixed-route ridership grew by 70 percent between 2015 and the end of 2017. Productivity is higher than ever before, providing more rides per dollar spent than at any time since Mountain Line began service in 1977. In addition, Mountain Line has received numerous comments from community members whose lives were changed for the better with these enhancements.

Recently, Mountain Line's Zero-Fare partners agreed to continue funding the Zero-Fare program through the end of 2020, and the agency began an ambitious effort to grow the partnership from 15 to 40 members, in honor of Mountain Line's 40th anniversary of service. Mountain Line hopes to continue this program for as long as our partners feel it is valuable to the community.

Existing Service

Frequency and span are important features of transit service to riders. Frequency describes the number of minutes between buses, and governs how much time someone spends waiting as part of their trip. Span describes the number of hours per day, and number of days per week, that a route operates, and governs how likely transit is to be available when someone wants to use it.

The map at right in Figure 2 shows the existing Mountain Line network. Routes are color-coded based on their weekday frequencies. Below it, in Figure 3, a table displays each Mountain Line route along with its span and frequencies during each hour on weekdays, Saturdays and Sundays.

This *2018 Strategic Plan* includes Short- and Long-Term Networks that will further increase frequencies and spans on certain routes, and will include new routes serving areas with high potential for transit ridership. Maps and tables similar to the ones at right are shown on the following pages, representing future network recommendations.

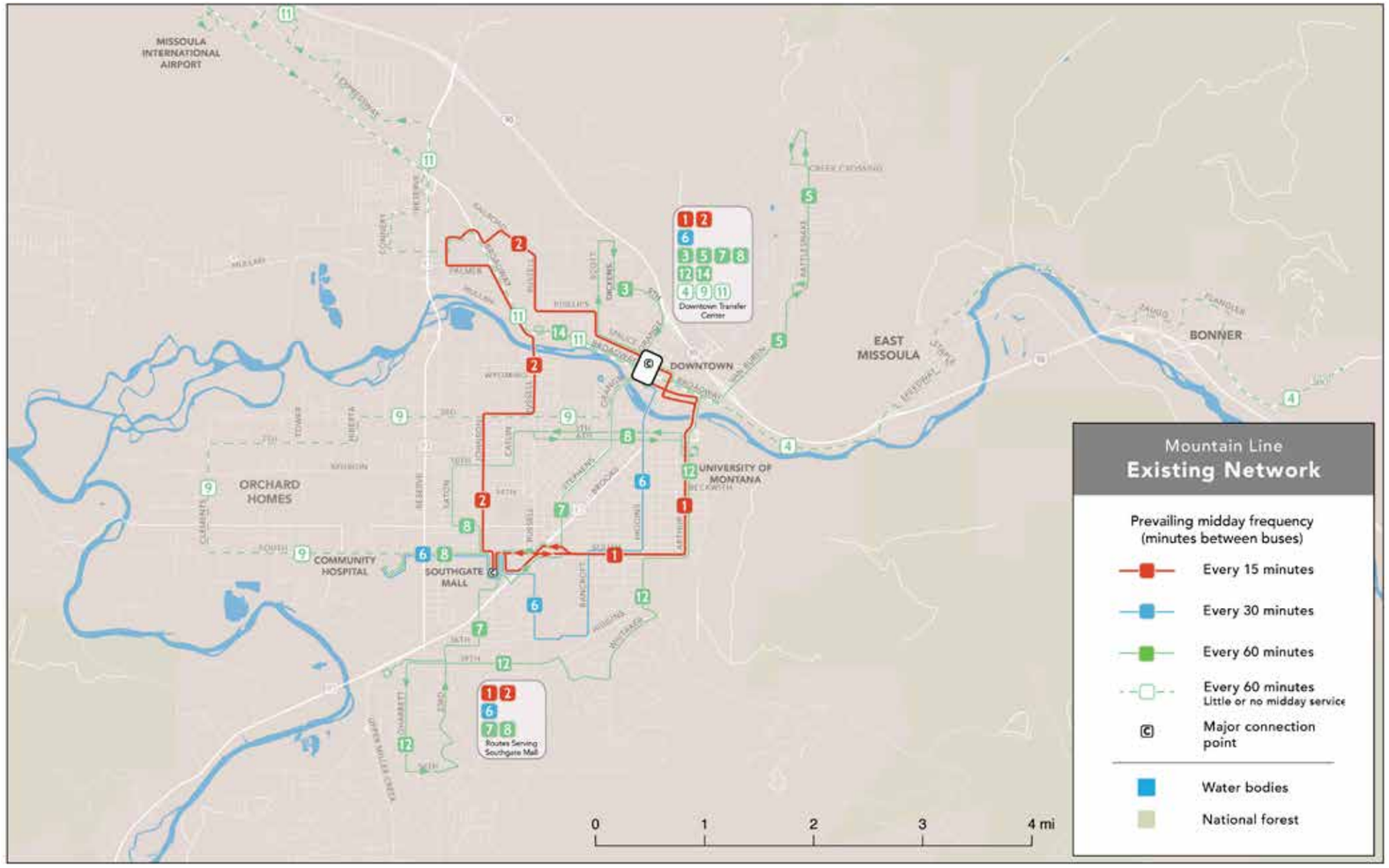


Figure 2: This map shows the existing Mountain Line network. Each route is color-coded based on its weekday midday frequency.

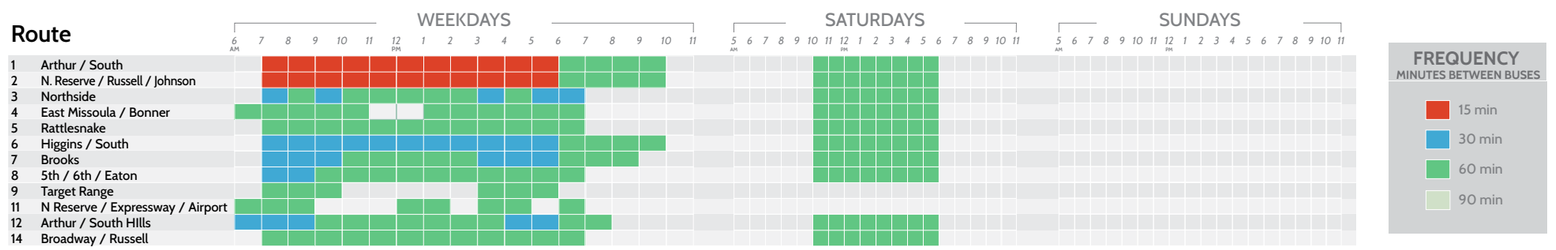


Figure 3: This table illustrates the frequencies and spans of service of each Mountain Line route, on weekdays, Saturdays and Sundays.

Short-Term Network

The map and table at right (in Figure 4 and Figure 5) show the transit network after five phases of service investment. Key features of this network include:

- The addition of Sunday service on most routes, as shown in the table at lower right.
- Longer hours of service on Saturdays on most routes.
- Earlier morning and later evening service on weekdays on most routes.
- The creation of *Bolt!* Route 15, offering 15-minute frequency between the Captain John Mullan neighborhood and downtown.
- Straighter, more direct Routes 2 and 11, so riders have faster trips.
- An increase in frequencies and spans on Route 7 to match *Bolt!* levels (every 15 minutes on weekdays) and align Route 7 onto Brooks Street for faster, more direct service.

This network will cost about $4 million more to operate per year than the existing system, which will cost about $6.7 million to operate in 2018. Five additional vehicles will be required, at a cost of up to $850,000 each. For Mountain Line to store and maintain those additional vehicles, a larger depot and garage will be required. (Mountain Line is already evaluating such an expansion.)[1]

The five phases of investment in this Short-Term Network can be implemented in parallel as funding and other opportunities permit. However, in order to estimate their incremental operating costs, they have been described in a sequence.

These short-term recommended improvements are described in greater detail starting on page 28.

Figure 4: At the end of the Short-Term Network, the Mountain Line transit network will offer shorter waits for service across more of the city.

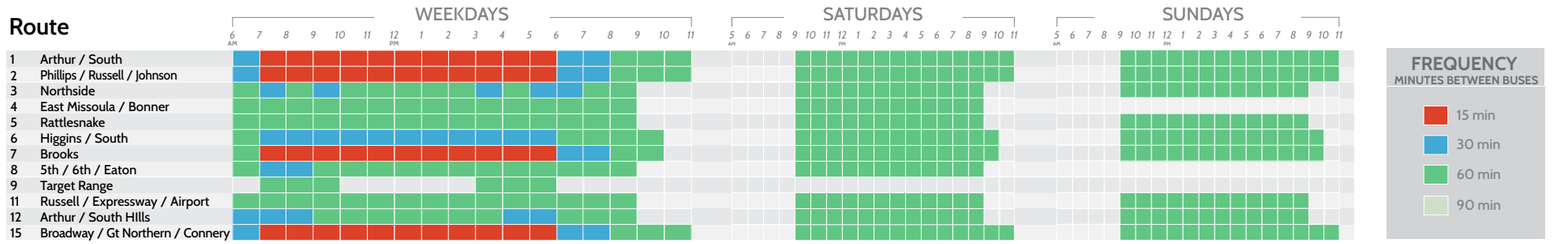


Figure 5: Spans of service will be longer on almost every route, on weekdays and Saturdays, and most routes will operate on Sundays as well.

1. All costs are stated in 2018 dollars

The Transit–Land Use Planning Conversation

The Long-Term Network shown on the following page is Mountain Line's contribution to a healthy conversation between land use and transportation planners in Missoula.

Two recent plans had major influence over the recommendations in this transit plan: the *Our Missoula City Growth Policy* and the *Long Range Transportation Plan*. The map at right shows land use designations from the *Growth Policy,* with uses that tend to generate higher transit demand shown in darker colors.

A Healthy Long-Range Planning Conversation

Similar conversations happen between land use and road planning; between transit and road planning, and for other kinds of related planning activities

Land Use Planning	Transit Planning
Here is a land use vision, conveying where residents, jobs and other developments will be in 20 years. →	Thank you! Here's a sketch of our most useful and permanent transit routes, that help serve that land use pattern.
← Thanks! Given that, here is a revised land use plan that takes more advantage of the permanent transit network. It shows a little more development around permanent lines, and prioritizes street and pedestrian connections there too.	Notice that this network, derived from your land use plan, creates some opportunities for development. It also has some inefficiencies that you could fix by adjusting the land use plan, like so…
Also, a couple of years have passed while we've been talking, so here's an updated plan to take us 20 years into the future. →	Thank you! Here's an updated transit network plan, reflecting the changes you made to the land use vision, and also extending further in the future.
	← Notice, in the network, there are now these other opportunities and inefficiencies…

And so on, forever, updating to keep the long-range plans about 20 years in the future.

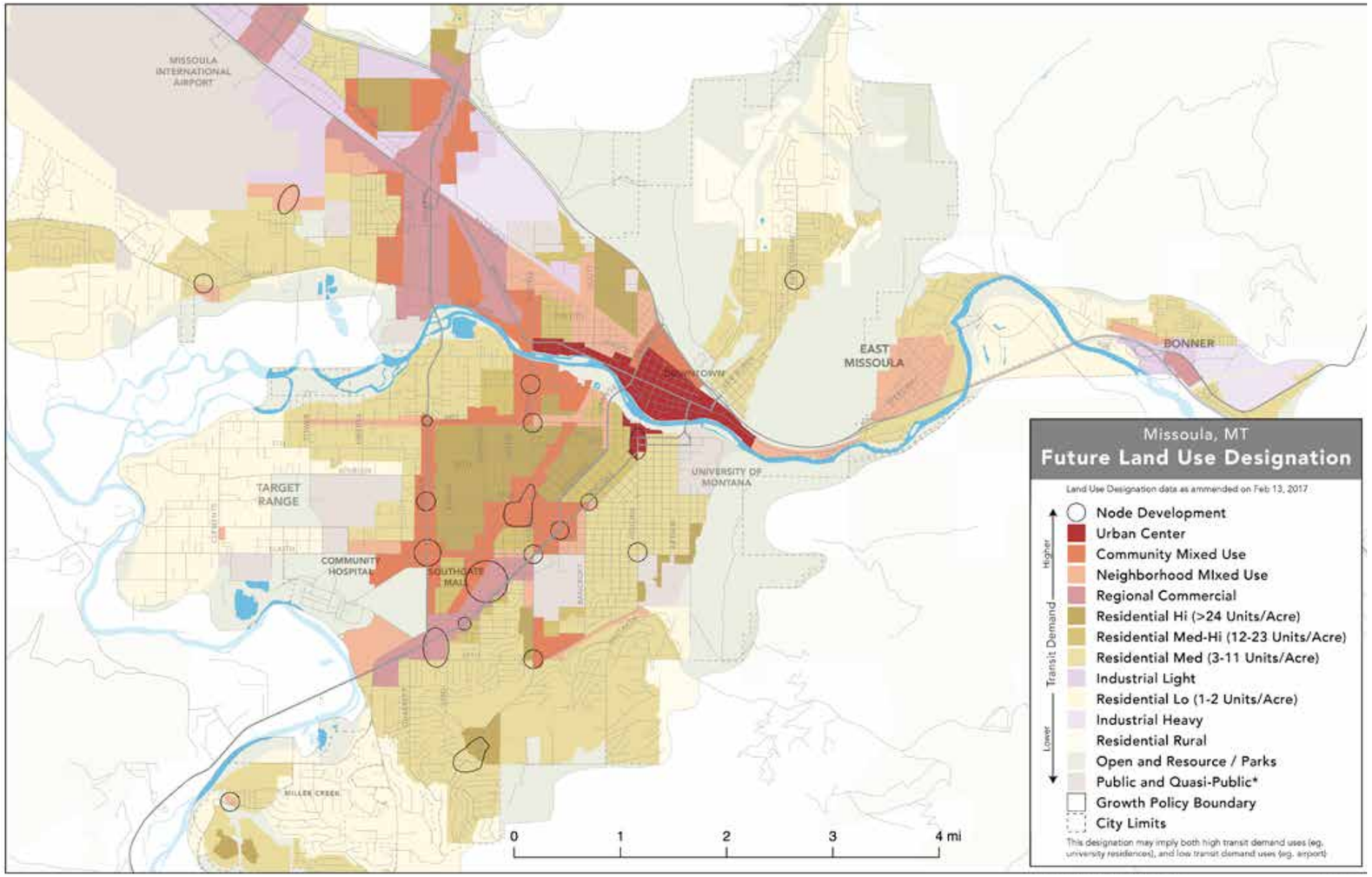


Figure 6: This map shows land use designations from the *Our Missoula Growth Policy*, styled to highlight uses that typically generate high transit ridership. Most of the dense development is focused around proximate and linear corridors, which are easy to serve with useful and cost-effective transit. Some designated growth areas will be difficult for transit to serve effectively. A description of how transit can serve this growth pattern begins on page 38.

Long-Term Network for 2043

The 2043 Long-Term Network is designed to respond to the city's growth and transportation plans, in order to improve transit in the areas most suited to cost-effective and high-ridership service.

This network will require about 2.5 times as much service as the existing Mountain Line network, using 140,100 hours of service per year (rather than the 57,700 service hours required to operate the existing network). It will also require an expanded fleet of vehicles, additional staff, improved bus stops, and other infrastructure.

One of the key features of this network is its frequent grid (shown in red and maroon in the map at right in Figure 7). It allows someone to go from anywhere to anywhere on the grid, with a single fast transfer. With a frequent grid, Mountain Line can offer freedom and mobility to large numbers of people without needing to provide everyone with a one-seat-ride to the places they care about.

A frequent grid is a very effective way to achieve high transit ridership relative to cost, which will be necessary to support the *Our Missoula City Growth Policy* and the regional *Long Range Transportation Plan*'s ambitious mode-share goals. However, this grid only becomes possible if 1) Mountain Line is able to invest in considerably more service, and 2) those investments are made in higher frequencies and longer spans in the densest and most walkable parts of the city.

The frequencies and spans of routes shown at right will be as good as those of routes of the same color in the Short-Term Network, shown on page 6. Most routes will operate seven days a week, and the *Bolt!* frequent routes will run until late at night.

This network will require substantial capital investments and street changes that are outside of Mountain Line's control. Working with partner agencies like the City of Missoula, the Montana Department of Transportation and Missoula County will be essential to implementing this network plan. Collaboration with non-profit and private partners, like the University of Montana and its student body, will also contribute to this network's success. This is discussed in further detail on page 16.

The ways that this network plan responds to existing policies, planned growth, geographic constraints and new opportunities are described starting on page 38. Capital investments that are necessary or beneficial for the implementation of this plan are described starting on page 46.

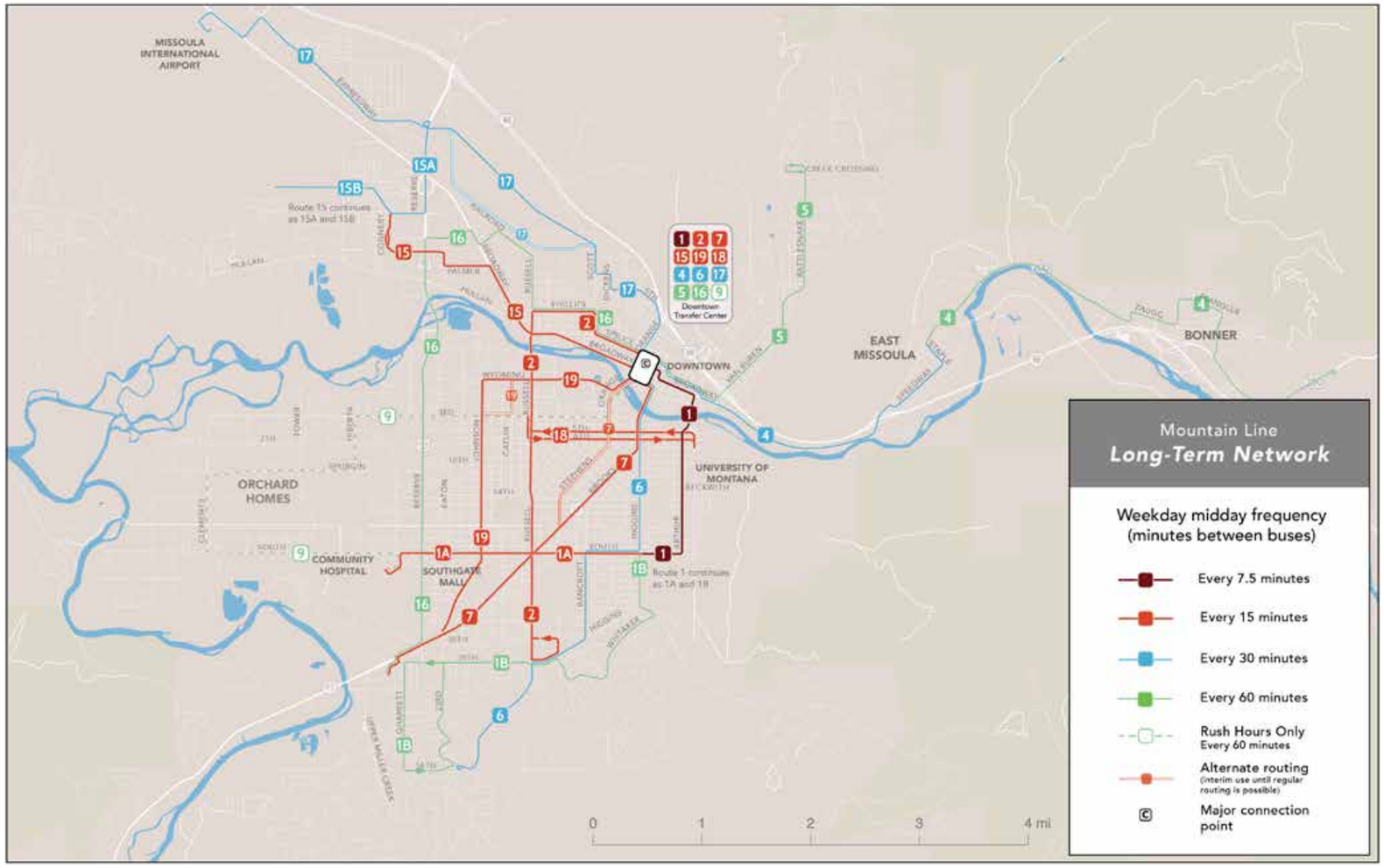
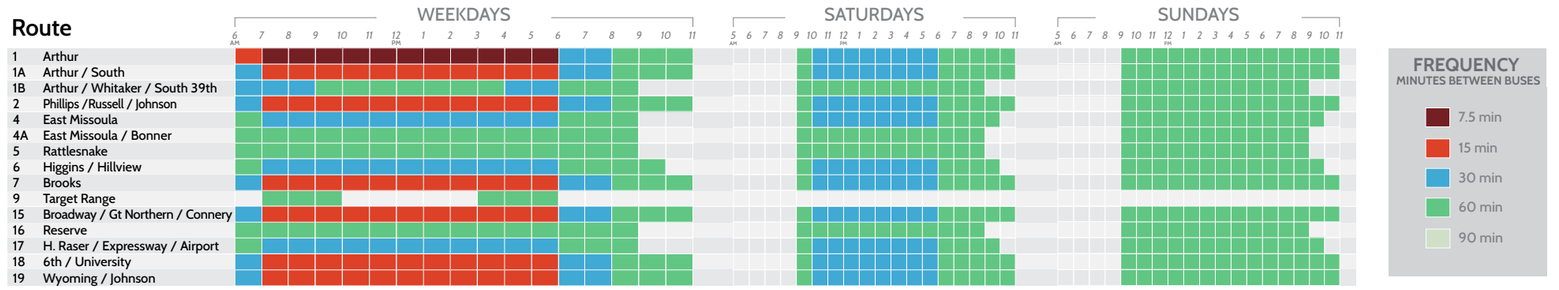


Figure 7: The 2043 Long-Term Network shows how additional funding for transit can be invested over the next 25 years in response to growth, geographic constraints and adopted transportation goals.



Primary Transit Network

The Primary Transit Network (PTN) is made up of corridors on which the most frequent and useful transit is likely to operate in 25 years. It can inform decisions about any new development that should be located near useful, all-day transit. Health facilities, major employers, schools, affordable housing, social services and other development that benefits from transit access should choose locations that aren't simply near any transit line, but *near a transit line that is likely to be very useful and permanent*.

This means that land use planners also need to know where transit is likely to be permanent, so they can create regulatory and economic conditions that draw such entities to these areas. The PTN can be described as *the transit network on which to build the city.*

> The PTN can be described as *the transit network on which to build the city.*

This PTN (shown at right in Figure 8) is an update of the PTN first introduced in Mountain Line's 2012 Long Range Plan. This update is based on the Long-Term Network and on expected growth in population and in Mountain Line's operating budget. The PTN reflects decisions made in recent land use and transportation plans, and is a response to those plans that helps illuminate where the most useful transit is likely to be in the future.

The PTN includes all frequent routes in the 2043 Long-Term Network. Routes planned for lower frequencies are included in this map in the background, but are not part of the Primary Transit Network.

Reserve Street is included as a candidate PTN corridor, but its candidacy is deeply contingent upon both future growth and radical change to the design and operation of the road[2].

This PTN map and the PTN corridors can be referenced by other planning processes. It can be used to focus development and infrastructure investments in the places where they will benefit the most from nearby transit and make the biggest lasting contributions to transit success.

The PTN and related policy recommendations are described starting on page 48.

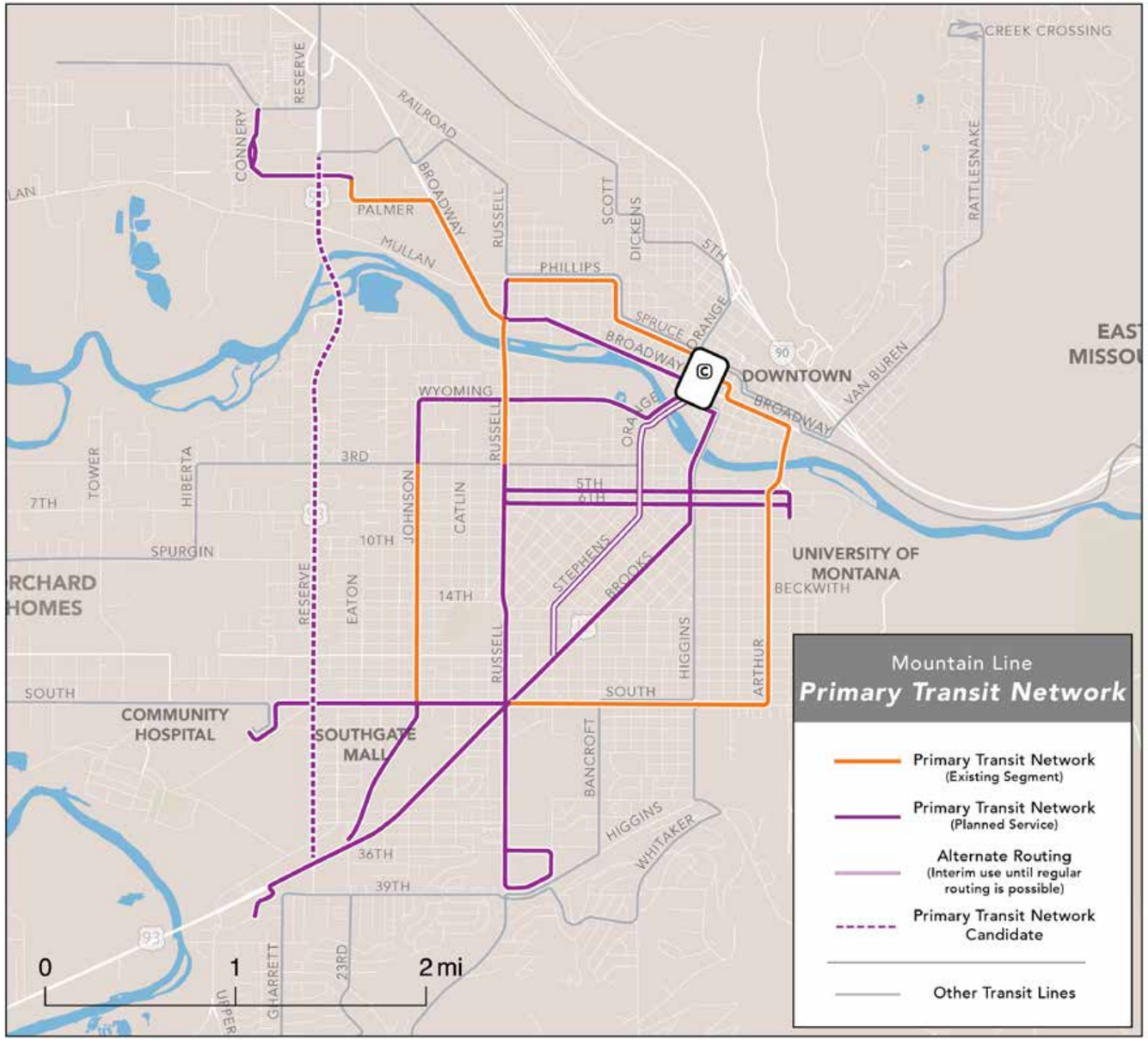


Figure 8: The Primary Transit Network is made up of corridors on which the most frequent and useful transit is likely to operate in 25 years. These corridors are based on the Long-Term Network, which is itself derived from the *Our Missoula City Growth Plan* and the transportation goals in the region's *Long Range Transportation Plan.* The designation of corridors is based not only on planned development patterns but also on geometric constraints that govern where transit can be cost-effective.

2. Reserve Street is discussed in further detail on page 49

Public Input on Key Choices

The Short-Term and the Long-Term networks are designed based on input from the public. In the spring and fall of 2017, Mountain Line consulted the general public and major transit stakeholders on some key choices for the future of transit in Missoula.

A Stakeholder Committee was given a basic transit training and then asked for guidance on the plan, at two meetings – one in the spring and one in the fall. Committee members were then polled on their preferences for key trade-offs in transit network design. After their meetings, the Committee members were encouraged to take the public web survey, and circulate it among their networks.

The general public was asked a similar set of questions through web surveys in the spring and fall of 2017. The spring survey gathered responses from 536 people while the fall survey gathered responses from 111 people. In addition, public open houses were offered in the fall at locations around Missoula.

Public and stakeholder input suggests:

- **Rather than increasing frequencies uniformly on closely-spaced parallel routes (like Routes 1, 2, 6, 7 and 8) Mountain Line should invest strategically in parallel routes that are farther apart, i.e. Routes 1, 2 and 7.** In this way, Mountain Line can provide a wider-spaced but more frequent grid of service, shorter waits and faster overall travel times in exchange for slightly longer walks.
- **Respondents to the web survey would not, on average, support reductions in geographic coverage in order to fund higher frequencies or longer spans of service.** While the Stakeholder Committee expressed modest support for shifting towards higher frequencies and higher ridership, respondents to the web survey expressed a modest preference for wide coverage, similar to the wide coverage provided by the existing network.
- **The top priority for new investment is most likely to be a longer span of service.**
- **Enthusiasm for serving areas based on planned development may be low.** Stakeholders generally prefer that Mountain Line focus resources on areas of existing demand.

Planning and Policy Actions

In addition to carrying out the planned growth of the transit network, Mountain Line should work towards some Planning and Policy actions to support its long-term ridership growth targets.

Action item: Determine which upcoming land use or development plan updates should take into account transit usefulness and permanence. Work with staff at the City of Missoula to reference the PTN or named PTN corridors in updated plans, where appropriate.

Action Items:

- Update Mountain Line system maps to make frequency and span visually obvious to the general public.
- Meet with City and County development-review staff to clarify where transit infrastructure investments should be required of new developments.
- Adopt a subsidy standard for any new demand-response service that relates to the subsidy provided on low-ridership fixed routes.
- Collect transfer and linked-trips data to better understand how ridership responds to network design changes.
- Create combined density and walkabilty guidelines to be used as a minimum standard for new coverage service.
- Work with the City to ensure that all annexations within the City are added to the Taxing District. Evaluate gaps in the District, especially where there is dense development that is proximate to the existing transit network, and explore ways to fix them.

1 Existing Challenges and Opportunities

This document is a 25-year plan for transit development in the Missoula Urban Transportation District (MUTD).

Input from the public, major stakeholders, and the Mountain Line Board informed the major choices made within this plan. Transportation goals and policies recently adopted by elected officials in the city also informed the choices made within this plan. A goal that underlies all parts of the plan is that of continuing to increase transit ridership and transit relevance in Missoula.

Our Missoula City Growth Policy 2035

The *Our Missoula City Growth Policy*, adopted in 2015, continues a "focus inward" strategy. (The map below in Figure 9 shows land use designations in the *Growth Policy*). The *Growth Policy* aims to accommodate growth without substantial increases in traffic congestion, through efficient land-use planning, and strategic investment in transportation infrastructure.

With its ability to move many people within limited road space, transit makes more economic activity possible at a fixed level of traffic congestion. However, this is only possible with a transit network that is useful to large numbers of people and therefore *attracts high ridership*.

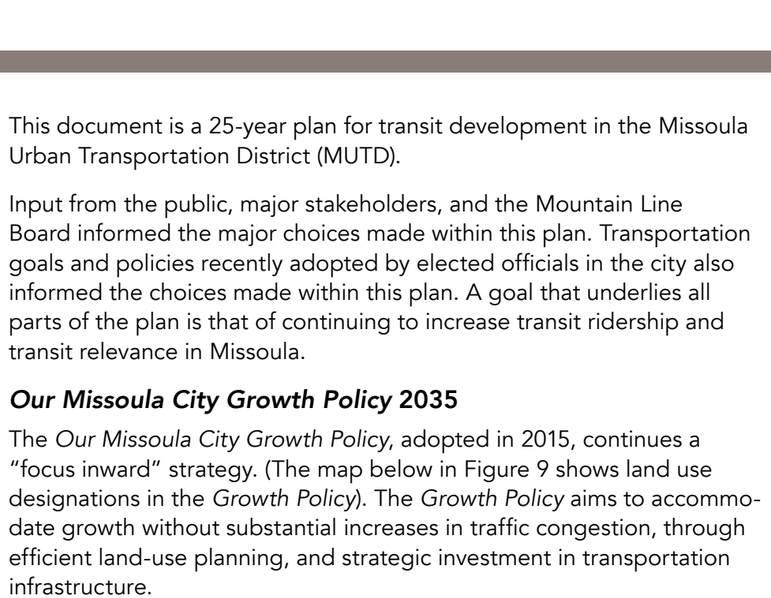


Figure 9: Land Use Designation Map from the *Our Missoula Growth Policy*. A modified version of this map, enhanced for transit planning purposes, is shown on page 40.

Activate Missoula 2045 Long Range Transportation Plan

The *Long Range Transportation Plan* (LRTP), adopted in 2017, outlines policies, plans, and a coordinated investment strategy for transportation agencies across the region.

The plan focuses on maintaining rather than expanding road capacity and includes no significant road capacity expansions aside from the Russell Street Bridge project, currently underway. As such, it requires a significant shift from automobiles to modes that move more people in the same amount of space, such as walking, cycling, and transit.

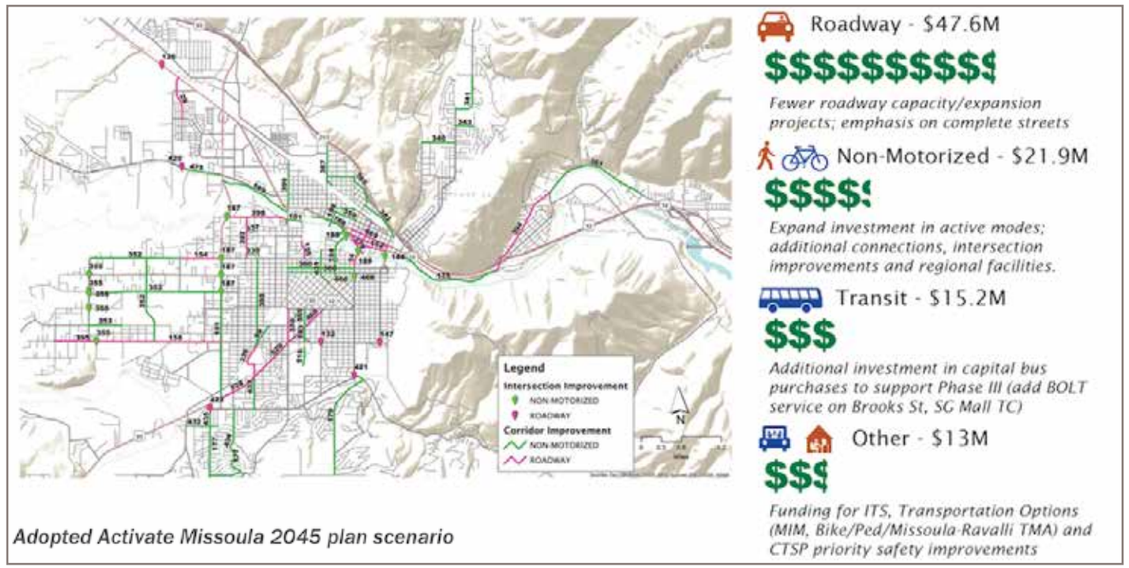
The LRTP adopts what is described as an "ambitious" mode shift goal, aiming to halve the percentage of trips made by driving alone from the current 70.5% to 34% by 2045, while tripling the percentage of trips made by walking, cycling, and transit.

> The LRTP's mode shift goals effectively require growing transit ridership to *over four times the current levels*.

Because the plan anticipates 48% population growth between 2014 and 2045, tripling the percentage of trips made by transit effectively requires growing transit ridership to over four times the current total.

The LRTP calls for prudent spending on roadway projects, with an emphasis on complete streets and increased investment in transit, pedestrian and cycling improvements.

Figure 10: Existing commute mode share for the Missoula Urban Area (from the 2045 LRTP)



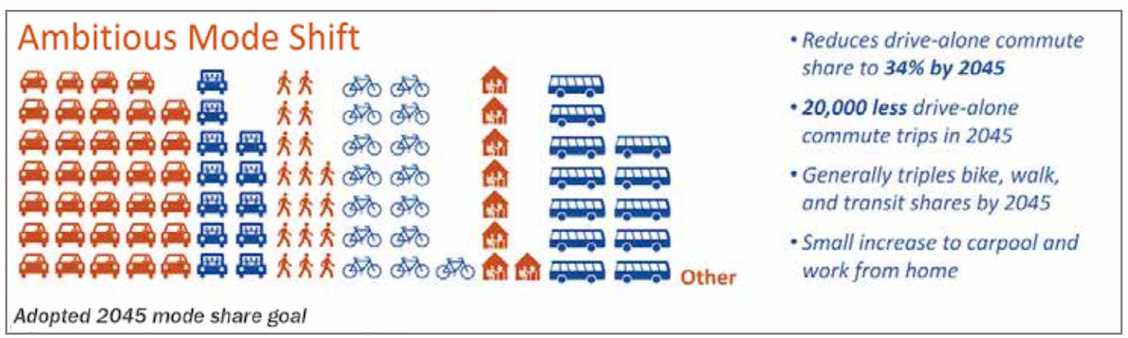


Figure 11: The adopted funding scenario (at top) and "ambitious" mode share goals (at bottom) in the 2045 regional LRTP.

The Transit Ridership Recipe

Some people have the impression that transit's success at attracting riders is within the control of the transit agency alone, but this is rarely the case. Land use, development, zoning, urban design, highways, railroads and street patterns all have effects on transit's usefulness and cost, and therefore on its ridership.

These factors are not directly controlled by Mountain Line, and yet they impact ridership and the costs Mountain Line must bear to attract that ridership. For this reason, most cities coordinate their transit planning with their land use and transportation planning.

Land use, development and transportation planning are led by several agencies, among them the City of Missoula, the Metropolitan Planning Organization and Missoula County.

Whenever Mountain Line is designing transit for high ridership, it will naturally focus service on places where ridership potential is high and cost is low.

Four key factors are:

- **Density**: How many people (or jobs, or other activities) are within a given distance of each stop?
- **Walkability**: Can people near the stop actually reach the stop?
- **Linearity**: Can transit serve an area in straight paths, or must it make time-consuming deviations?
- **Proximity**: Are there long gaps between destinations and strong markets that transit must traverse?

A simple way to visualize the different ways they impact ridership and costs is to ask: *"How far do we have to drive a bus to serve 100 people?"* The lower this distance is, the higher the ridership potential of an area and the lower the cost to serve it.

Density and walkability, as factors for transit success, are well-understood by most land use planners, transportation planners and developers. The importance of linearity and proximity are less well-understood. As a result, some ostensibly "transit-oriented developments" get put on parcels that are not in a linear pattern with other developed areas, or that are far away.

Linearity and proximity tell us about both ridership potential and cost: *"Are we going to be able to serve the market with fast, direct lines, or will we have to run indirect or long routes, which cost more to operate (and cost riders time)?"*

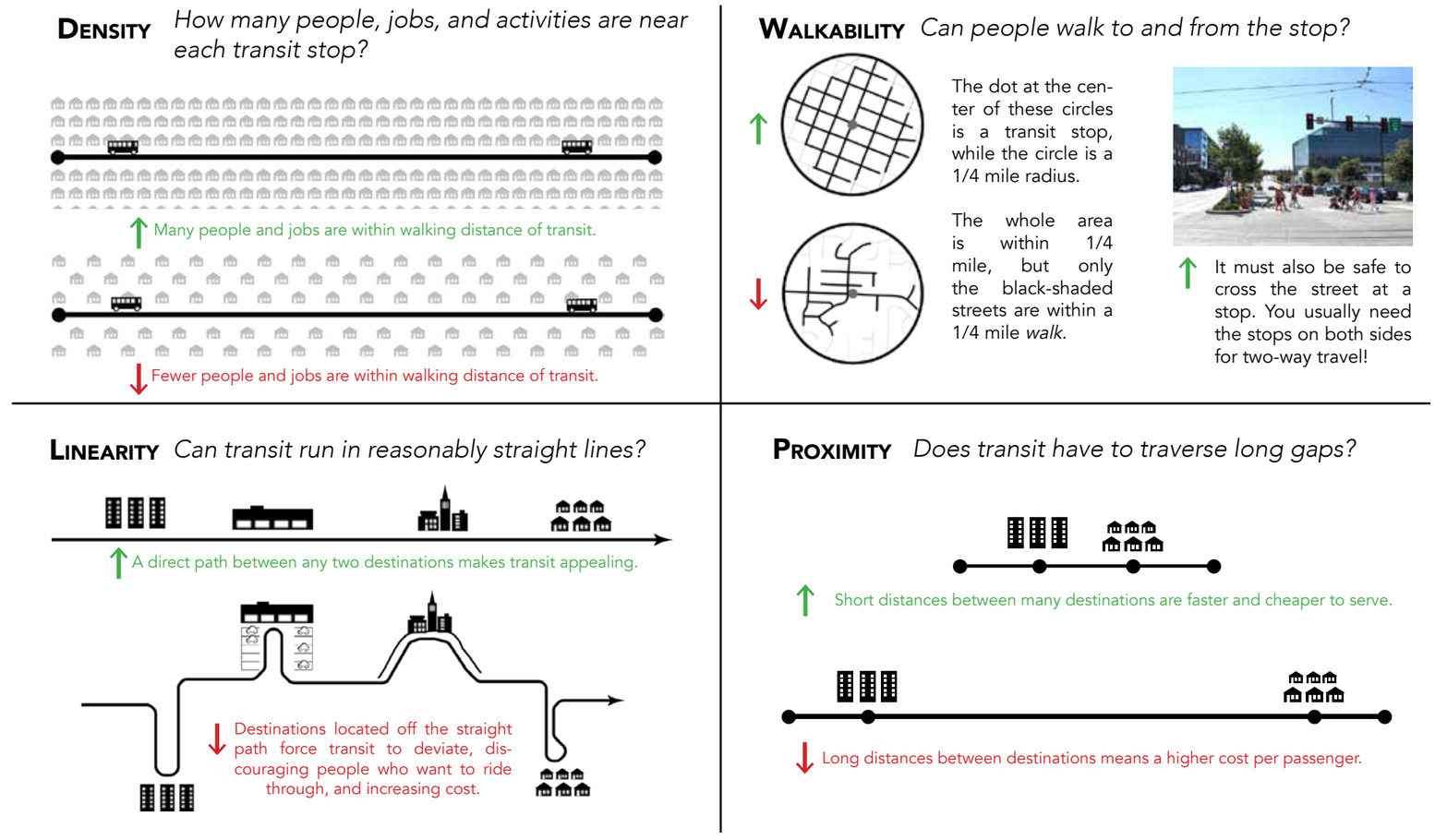


Figure 12: The Ridership Recipe describes land use and street conditions that govern transit ridership potential, but are out of the control of the transit agency.

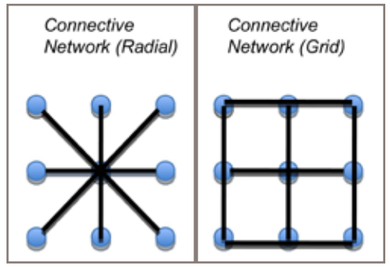
In this Plan, we describe in particular how linearity and proximity (or a lack thereof) will govern the cost of providing transit service to areas where denser development is foreseen in Missoula. Most of the growth planned in Missoula follows the "Ridership Recipe," with a few exceptions.

For an exploration of existing land use patterns and their impact on transit performance in Missoula today, see Volume I of this Plan.

Existing Network

The existing Mountain Line network uses approximately 57,110 annual revenue hours to provide two frequent, 15-minute routes (1 and 2), and one 30-minute route (6), connecting with a network of 60-minute routes. Limited service is available on Saturday and no service is provided on Sundays or holidays.

The Current Network is a Radial Network



Mountain line currently operates a primarily radial network, where most routes simply go from outlying neighborhoods into the center of the city.

Radial networks generally work well for small cities. They provide one-seat rides for most people to their activities – so long as those activities are in the city center.
Those needing to travel to places outside the city center can connect to other lines downtown. Radial networks make it possible to connect low-frequency routes in a predictable way, as described in the next section.

Most larger cities, however, do not have only one center of activity. Some very large metropolitan areas – such as Chicago – are so dense across such a large area that they truly have everywhere-to-everywhere travel demand. These cities tend to develop a grid network, such that every place in the city is at most one transfer away from every other place in the city. However, since most trips require a connection in a connective network, its routes must be operated at high frequency (15 minutes or better) to ensure that connections are not too onerous.

Missoula is not such an extreme case, but has at least four obvious areas of concentration: downtown, the university, the areas around Reserve Street and the areas around Southgate Mall.

Pulsing makes Low-Frequency Transfers Work

Small-city radial networks, including Mountain Line's network, are often operated with a "pulse" downtown.

To offer a pulse, an agency must design its routes to be a certain length so that buses can all arrive downtown at the same time, each hour. The buses dwell together for a few minutes, passengers connect among them, and then they depart again, all at once.

If a transit agency designs the network so that those low-frequency

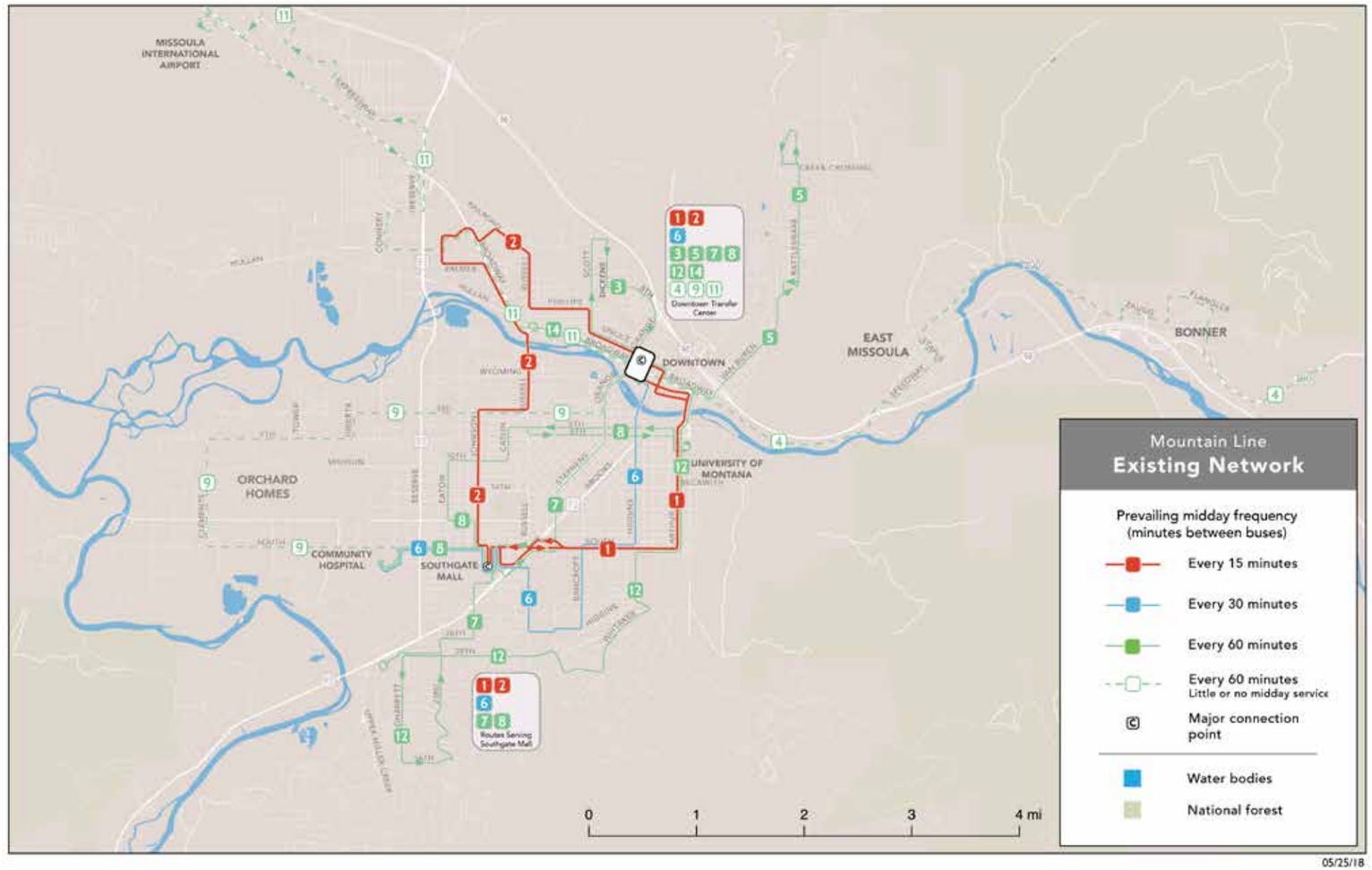


Figure 13: Mountain Line Existing Network

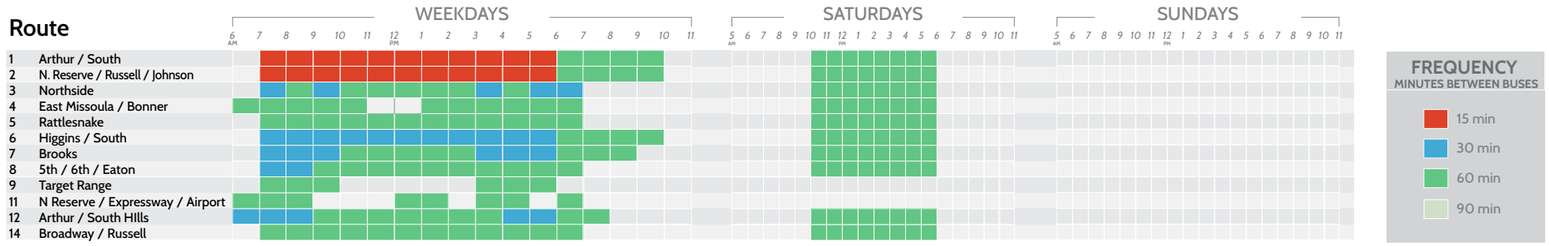
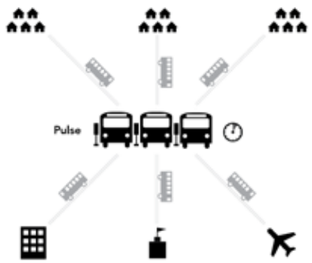


Figure 14: Frequency and Span of existing network.

routes pulse together at a Transfer Center, people's wait at the connection point will be reliably just a few minutes long. This is a great design as long as there is no unpredictable traffic congestion and buses run on time. If someone's low-frequency bus misses the pulse, the consequences are severe because they have such a long wait until the next one.

Building a Connective Network That's Less Reliant on Pulsing



Radial networks are well-suited to pulsing, and vice versa. Mountain Line currently operates a pulse downtown: a set of low-frequency routes come together downtown once every hour, wait for one another and for passengers to transfer among them, and then depart outbound. (There is also a smaller pulse with just a few routes at the Southgate Mall.)

However, there are a few characteristics of Missoula that make it less necessary and less beneficial to operate an *entirely* radial network:

- There are multiple activity centers and they are across the river from one another, so they cannot all be near the center of a radial network.
- A few high-density corridors do not point towards downtown, in particular Russell and Reserve.
- Because the City and Mountain Line have chosen to "Focus Inward," rather than spread service and development widely, Mountain Line is offering some high-frequency routes through the densest areas. This makes it possible for people to transfer, outside of downtown, with a reliably short wait.

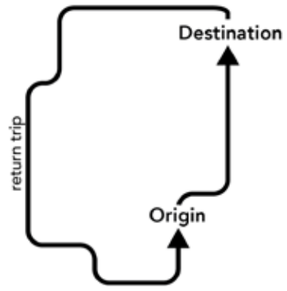
For these reasons, Mountain Line does not offer a purely radial network. Instead, it combines a radial network with a very simple two-route frequent grid: Routes 1 and 2 form a square across the city, offering the highest frequencies in places with high ridership potential. The two routes connect with one another downtown and at Southgate Mall.[1] In the background of this simple frequent grid is a low-frequency radial network, on which quick connections can be made downtown.

1 In practice, Routes 1 and 2 operate as a big loop, with Route 1 buses continuing as Route 2 buses and vice versa. However, that depends on operational details that may not be permanent, so the transit agency wisely markets these services to customers as separate routes.

As frequency increases on many routes in the later phases of this plan, the Mountain Line network will become more and more of a connective network. This future network will allow for easier travel for trips that do not begin or end in the city center and be less reliant on a downtown pulse.

One-Way Loops

Small one-way loops are sometimes put at the ends of routes, in order to turn the bus around. At the end of a route, buses tend to be empty, so very few people have to ride around the loop. But sometimes larger one-way loops are used to provide coverage: service that gets close to people, but doesn't attract much ridership. One-way loops sacrifice directness and travel time in order to cover a larger geographic area. Route 3 is a one-way loop, and Routes 11 and 12 include large one-way loops at one of their ends.



How does a rider experience this sacrifice? It may be that on their way out, they can get on the bus and it goes in the direction they are traveling, so the trip feels fairly direct. But on their return trip (as illustrated on the left), they must ride around the loop the long way, out of direction, to get back to where they started.

A one-way loop is much less attractive to people whose time is scarce and valuable because ***the loop guarantees that in one direction or another, the trip will be long and circuitous***. When combined with the long waits from low frequencies like on Route 3 and Route 11, many people may find it to be faster to walk.

Route 11 is Unreliable

Route 11 currently operates on a large one-way loop, serving passengers on Expressway (a two-lane road north Broadway/Highway 10) in the outbound direction on its way to the airport, but returning to the city via Broadway.

The one-way loop was implemented in order to shorten the route's round-trip time, so that it could meet the hourly pulse downtown. This means that for each round trip a person takes from that part of the city, they have to ride all the way around the loop. In addition, Route 11 is still falling behind schedule by as much as 15 minutes during rush hour, which causes its riders to miss the downtown pulse. Improvements to address these problems with Route 11 are included in Phases 1 and 4 of the Short-Term Plan.

Route 3/5/14

Routes 3, 5, and 14 are "interlined", meaning the same vehicle drives all three routes one after another and that delays on one route can result in delays on all three. Trips on these routes are currently often late, missing the Downtown Pulse. Since Route 14 is completely duplicated by Route 11, Route 14 can be eliminated to improve the reliability of Routes 3 and 5 without eliminating service for anyone.

Route 8 Struggles to Compete for Ridership

Productivity is a transit industry term for what lay-people might call "efficiency." If ridership is an outcome people care about, then ridership relative to cost describes how "productive" an agency is towards that outcome. The productivity ratio is:

Productivity = Ridership / Cost = Boardings / Service hour

Mountain Line's routes range in productivity from approximately 14 to 33 boardings per revenue hour with Route 8 carrying the lowest ridership per hour. Attracting ridership on this route is difficult since both segments of the route are competing with other routes for potential transit riders.

On its east-west segment, along 5th and 6th, Route 8 is completely duplicated for east-west travel by the university's U-Dash Purple Line. On its north-south segment, between 3rd and South, Route 8 parallels Route 2 but in a very circuitous pattern. Anyone who is in hurry, but is willing to walk a few blocks, likely walks to Route 2, which offers much shorter waits and a more direct ride to Southgate Mall. Finally, Route 8 reaches Community Medical Center only after a major deviation to Southgate Mall.

Mountain Line currently plans to maintain service on Route 8, but expects Route 8's ridership per hour to remain flat, or to decline if competing routes become more useful with increased frequency.

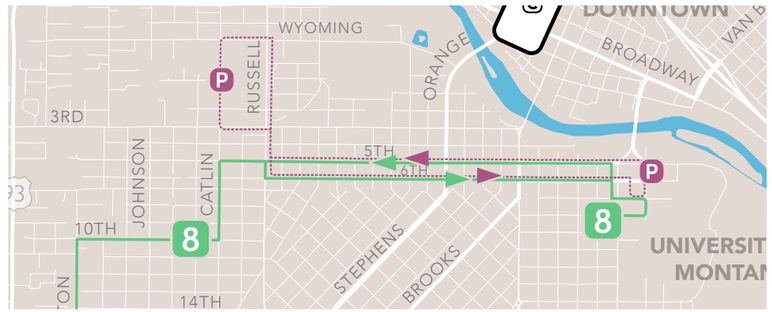


Figure 15: Route 8's east-west segment is in competition with the U-Dash Purple Line.

Route 8 could be made more useful if it were combined with the university's U-Dash service to offer consistent, more frequent service all year.

Peaking

Like many other transit agencies, Mountain Line offers higher frequency during the AM and PM rush hours than during the rest of the day. Routes 3, 7, 8, and 12 all offer 30 minute frequencies during rush hours, but otherwise run at 60 minutes. Routes 4, 9, and 11 offer hourly service during rush hours, but not for the rest of the day.

As described in Volume I, these rush-hour services are more expensive to operate than all-day service because they require additional vehicles and drivers to cover short pieces of work. It is fair to expect rush-hour buses to be more crowded than buses at other times, so the higher costs of rush-hour peaking are divided across more passengers.

Unlike many other cities, Missoula's transit demands are not dominated by the traditional rush-hour commute. Some routes' frequencies increase more than demand at rush hours (especially in the mornings). The graph below shows weekday ridership by hour. While boardings peak in the afternoon, AM rush hour ridership is barely higher than at midday.

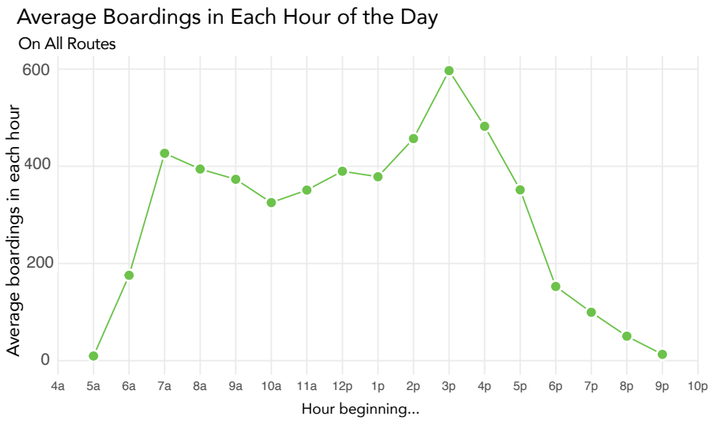


Figure 16: Total boardings by hour, on weekdays. Morning ridership is barely higher than midday ridership. Between 3 and 4 pm ridership peaks, due to student demand.

Fleet Constraints

Mountain Line's fleet of buses is fully utilized on weekdays at rush hours. This means that it is not possible to add frequency at rush hours to any route without adding additional buses. Mountain Line's bus storage and maintenance facility is also at capacity and cannot accommodate any more vehicles until it is expanded.

This leaves only two options if Mountain Line wishes to increase frequencies in the near term:

- Reduce peak frequency on routes with low productivity such as Routes 8 or 12, to free up one or more vehicles.
- Take routes that currently have higher frequency at rush hours and extend that frequency to all-day. This can be done most obviously for Route 7.

In the long term, Mountain Line will have to build a new, larger bus depot in order to store and maintain more buses. This will be detailed in a *Facilities Master Plan* that Mountain Line is currently developing.

Collaborating with the University

The Associated Students of the University of Montana (ASUM) charge themselves a fee to fund four "U-Dash" routes in and around campus (as shown on the network map on page 30). U-Dash is open to the general public for no charge but is only in operation during the academic year.

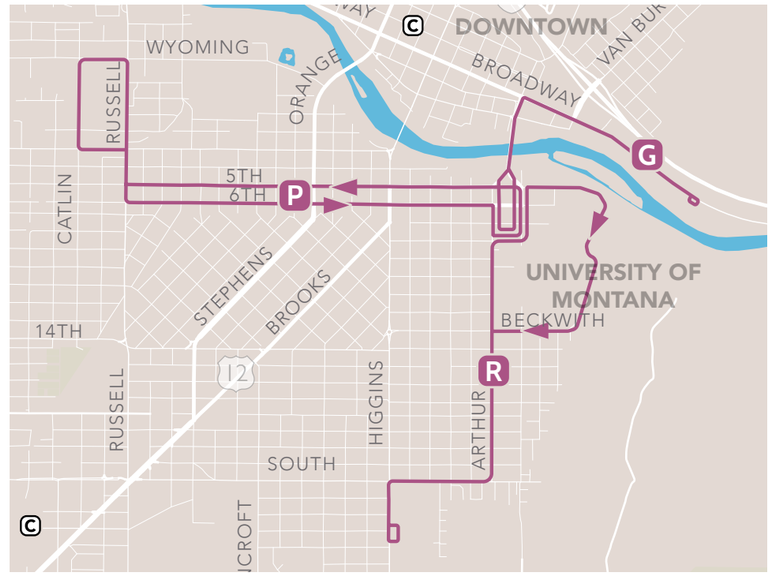


Figure 17: The U-Dash Network. Daytime frequencies are 15-minutes for the Green Line (G), 12-minutes for the Red Line (R), and 30-minutes for the Purple Line (P).

It is clear from ridership patterns that university students and staff rely enormously on the Mountain Line network, and contribute to its productivity and relevance in the city. However, universities generate such tremendously high ridership when classes are in session that it is natural for there to be specialized routes focused on that peak demand.

A city's transit agency, on the other hand, is responsive to year-round ridership, as well as university ridership. Thus Mountain Line and ASUM have a set of different, though sometimes overlapping, interests.

Some U-Dash routes duplicate Mountain Line routes, but the scheduling is less complementary than it could be, resulting in some unintended competition for riders.

Some U-Dash routes duplicate Mountain Line routes but the schedules are not combined in a way that would make them feel like a single, more-useful route to passengers. Without this complementary scheduling and planning, the potential transit markets are divided between the two services, and there is likely less total ridership than would otherwise be possible. This is the case for two pairs of routes:

- **Mountain Line's Route 8 and U-Dash's Purple Line** along 5th and 6th Streets together offer an average of three trips per hour. Because the schedules are not coordinated, customers cannot depend on a wait of no more than 20 minutes.
- **Mountain Line's Route 1 and U-Dash's Red Line** also overlap each other, with the Red line serving South Avenue and Arthur Avenue every 8 to 12 minutes. However, the Red Line terminates at the University of Montana instead of continuing onto Downtown Transfer Center, a major connection point for accessing the rest of the Mountain Line network.

A partnership between the Mountain Line and U-Dash could allow for higher consistent frequencies along shared routes. There could also be opportunities to increase the year-round utilization of U-Dash's buses, which are currently put in storage at the end of the academic year.

Partnership can take many forms. For example, some partners split up the network through a cost-share agreement, with one agency running one set of routes and the other running the rest. Some go even further and "share" routes, running a mix of the two agency's buses on a single route. While the most extreme version of integration is to become a single agency, there are improvements that Mountain Line and ASUM can make that do not require combining agencies.

Zero-Fare

Mountain Line buses are currently free for anyone to ride, thanks to the Zero-Fare program. Numerous organizations in Missoula have made financial contributions towards the program, which was started in 2015. (The financial contributions are necessary to replace the small amount of revenue that fares raise.)

Zero-Fare has caused Mountain Line's ridership and productivity to grow enormously over the past several years, at a time when most transit agencies are seeing ridership losses. Ridership increased among all demographics of Mountain Line riders.

Zero-Fare has caused Mountain Line's ridership and productivity to grow enormously over the past several years, at a time when most transit agencies are seeing ridership losses.

Not charging a fare saves Mountain Line considerable administrative costs, mostly arising from cash handling but also from marketing and customer service. It also provides significant gains in the reliability of its fixed route service, particularly at peak times, by reducing the amount of time needed for boarding. Concerns about the possibility that fare-free buses would become unruly or unsafe places have been assuaged in the years since the start of the program. Mountain Line may be able to access a small amount of additional federal operating funds, as a result of higher ridership, though the amount available from year to year is uncertain.

The first three-year pilot ended at the end of 2017, but all of the Zero-Fare partners agreed to continue funding the program for another three years. The current funding commitments by 20 partner organizations will end at the end of 2020.

2 Public Input on Key Choices

2 Public Input on Key Choices

In the spring and fall of 2017, Mountain Line consulted the general public and major transit stakeholders on some key choices for the future of transit in Missoula.

A Stakeholder Committee was given a basic transit training and then asked for guidance on the plan, at two meetings – one in the spring and one in the fall.

During their meetings the Committee members were polled on the questions described below. After their meetings, the Committee members were encouraged to take the public web survey, and circulate it among their networks.

The general public was asked a similar set of questions through web surveys in the spring and fall of 2017. The spring survey gathered responses from 536 people while the fall survey gathered responses from 111 people.

In addition, public open houses were offered in the fall at locations around Missoula.

Key Choices

There are three major ways that an agency can increase service:

- Improving frequencies, so that the wait time between buses is shorter.
- Lengthening spans, so that service is available during more of the day and night, and over more days per week.
- Expanding coverage, so that a larger geographic area is covered by at least some transit service.

We queried Mountain Line stakeholders and the public about the relative value of these types of service increases.

Personal preference between walking and waiting

In designing a transit network, a transit agency must balance these two design principles:

1. Giving people short walks to a bus stop.
2. Giving people short waits for the bus.

The way to provide #1 is to provide more parallel routes close together, so that no one is very far from a route. Providing more routes using the same budget requires that each of those routes gets less service, which means each route can't be very frequent. As a result, people have short walks to a route, but the service isn't likely to be coming at the time they want to travel, and so their waits are long.

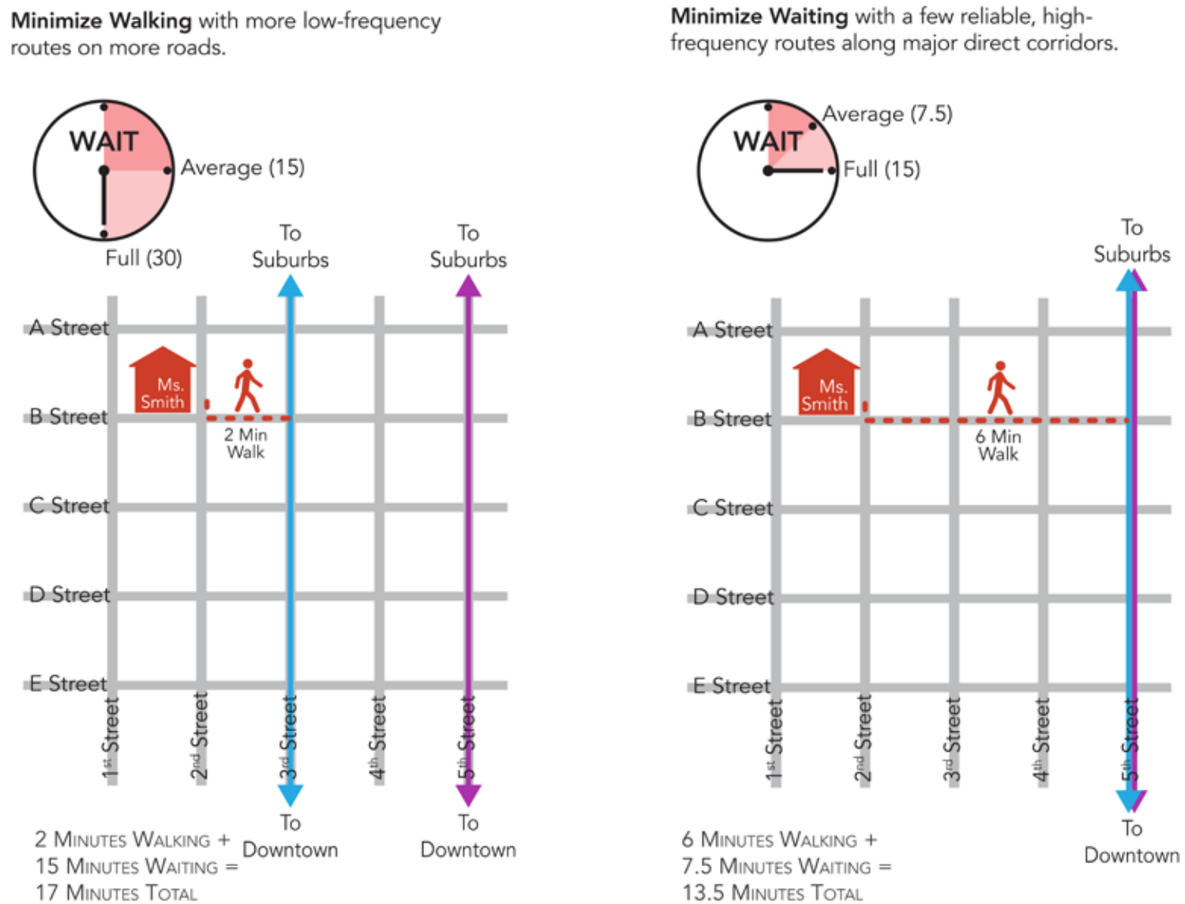


Figure 18: As Mountain Line continues to evolve and improve its transit network, it will have to balance desires for short waits with desires for shorter walks. This is particularly relevant south of the river, where the street network is fairly gridded. This means that Mountain Line has a choice in whether to divide its service into a larger number of less-frequent parallel routes...or a smaller number of more-frequent parallel routes.

The way to provide #2 is to concentrate the service budget into fewer routes, so that each route can have a higher frequency. Providing fewer routes requires that those routes are farther apart from one another. As a result, people have a longer walk to a bus stop, but the service is more likely to be coming at the time they want to travel, and so their waits are short. This trade-off is illustrated above in Figure 18.

Understanding how people tolerate walking and waiting is a helpful input to a transit plan, because it tells the agency whether service should be spread out into more (infrequent) routes, or concentrated into fewer (more frequent) routes.

Among respondents to the web survey, 72% indicated either tolerance or enthusiasm for walking farther, in order to get a shorter wait for the bus. Only 21% said that they would prefer a shorter walk to the bus more than a shorter wait for the bus. The responses to these surveys are shown in the chart at top, in Figure 19.

Among members of the Stakeholder Committee, nearly everyone expressed a willingness (or an eagerness) to walk further in order to get a shorter wait for the bus. The results of this poll of the Committee are shown in the chart at bottom, in Figure 20.

This input from the public and from stakeholders suggests that wherever Mountain Line is running parallel routes, and walkability between those routes is good, the possibility of combining those routes into fewer, more frequent routes should be considered. This is particularly relevant on the south side of the city, where many parallel or mostly-parallel routes are closely-spaced and therefore compete for some of the same riders.

Takeaway: Public and stakeholder input suggests that rather than increasing frequencies uniformly on closely-spaced parallel routes (like Routes 1, 2, 6, 7 and 8) Mountain Line should invest strategically in parallel routes that are farther apart, i.e. Routes 1, 2 and 7. In this way, Mountain Line can provide a wider-spaced but more frequent grid of service, shorter waits and faster overall travel times in exchange for slightly longer walks.

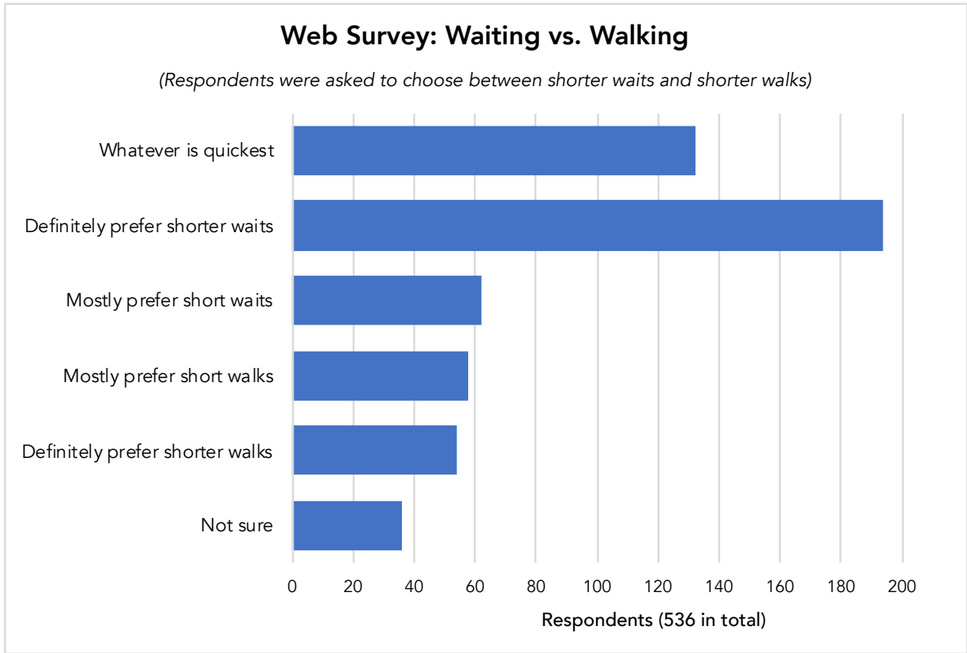


Figure 19: In response to the web survey, 72% of people said they would rather walk further than wait longer for transit. 536 people responded to this question.

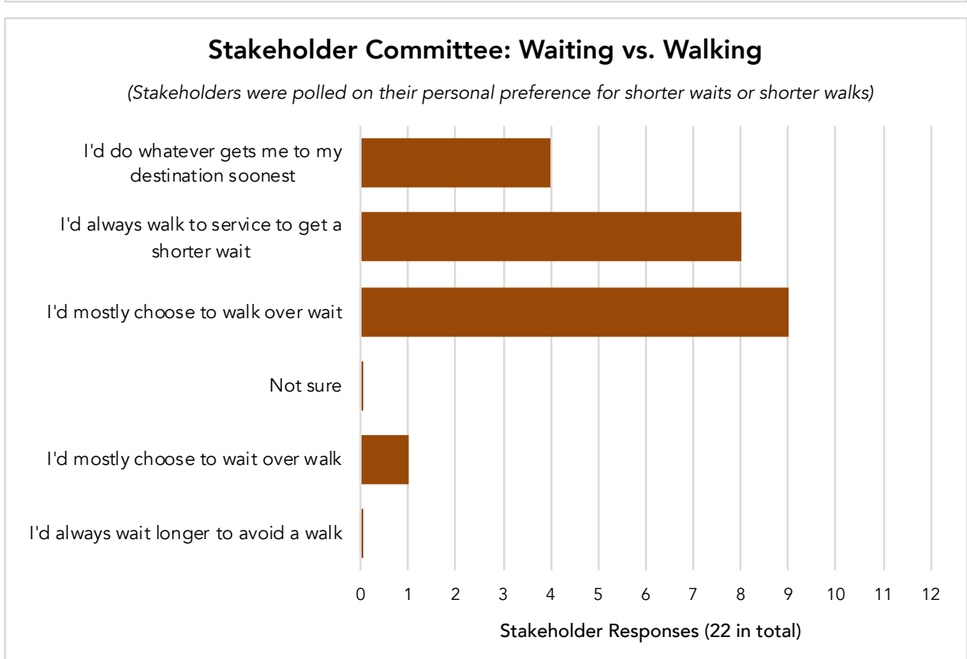


Figure 20: At the end of a training, an interactive workshop and discussion, the Stakeholder Committee was polled on some key choices for transit. Nearly all of them expressed a personal preference for longer walks rather than longer waits.

Relative values of high frequency (high ridership) and high coverage

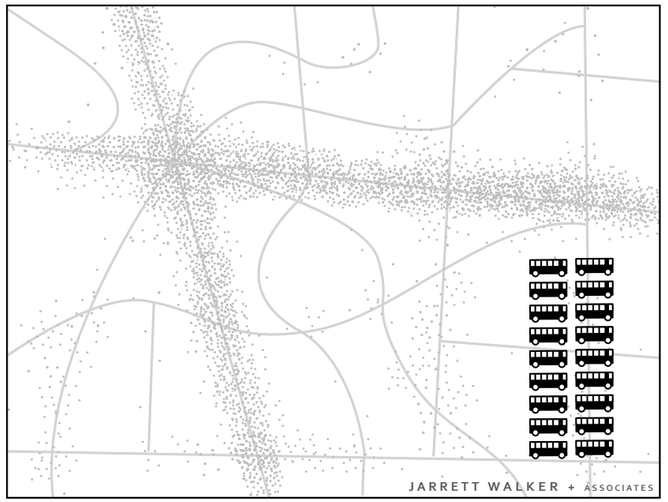
Some of the questions asked of stakeholders and the public related to the balance between higher frequencies and higher coverage.

In any transit network, there is a trade-off between concentrating service into fewer lines, so that each line can be more frequent and spreading service out into more lines, so that a larger geographic area is covered. Neither approach is technically correct, but these outcomes trade-off against one another in a fixed budget.

We asked stakeholders and the public questions how Mountain Line should make this trade-off. The current Mountain Line network achieves high ridership on a few routes, while many routes achieve low ridership but cover important places.

We drew fictional network maps for a fictional town, illustrating how a network could provide more coverage (but worse frequencies) or higher frequencies (but less coverage). These illustrations are shown at right, in Figure 21. The existing Mountain Line network is in between these two examples, but is more like the Wide Coverage example.

(The trade-off between concentrating service into fewer, more useful routes, and spreading service widely into a larger number of less-useful routes, is described at greater length in Volume I of this Plan.)



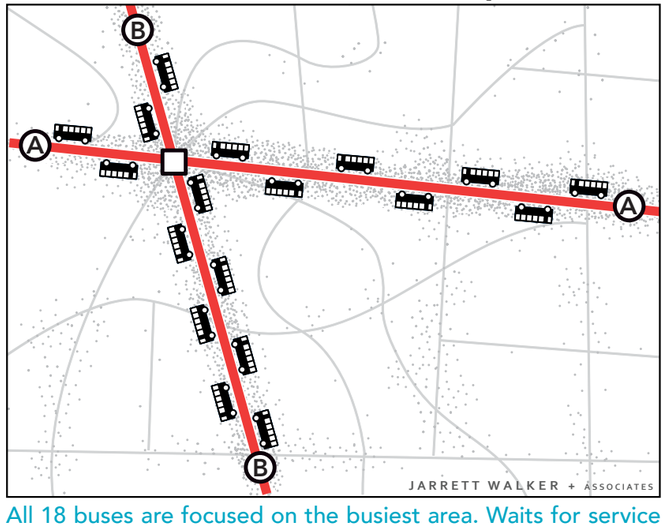
Imagine you are the transit planner for this fictional town.

The dots scattered around the map are people and jobs.

The 18 buses are the resources the town has to run transit.

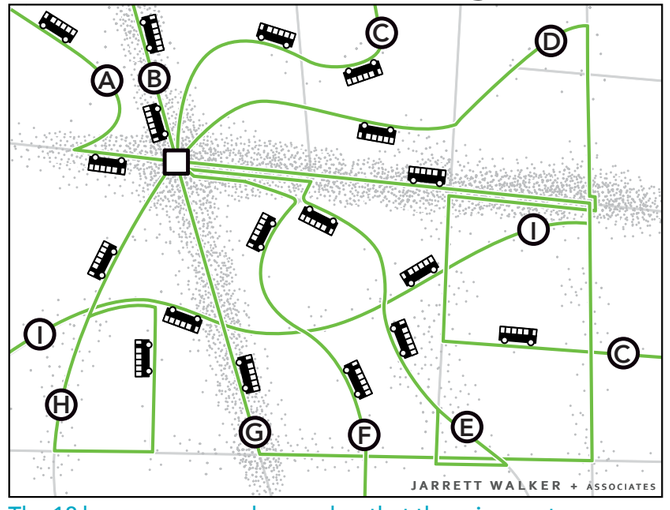
Before you can plan transit routes, you must first decide: What is the purpose of your transit system?

Maximum Ridership



All 18 buses are focused on the busiest area. Waits for service are short but walks to service are longer for people in less populated areas. Frequency and ridership and high, but some places have no service.

Maximum Coverage



The 18 buses are spread around so that there is a route on every street. Everyone lives near a stop, but every route is infrequent, so waits for service are long. Only a few people can bear to wait so long, so ridership is low.

Figure 21: This illustration of alternate transit networks for a fictional town was used to ask members of the public and the Stakeholder Committee how they value high ridership relative to wide coverage.

In the web survey, using the same fictional network examples shown on the previous page, the public was asked how Mountain Line should balance frequency and coverage. Slightly more respondents preferred the High Coverage example than the High Ridership/Frequency example. Web survey responses to this question are show in the chart at top, in Figure 22.

The High Coverage example is much more like the existing Mountain Line network than is the High Ridership/Frequency example. This suggests that web survey respondents would not, on average, support reductions in geographic coverage to fund higher frequencies or longer spans.

The Stakeholder Committee was asked a similar question, also using the fictional town and networks shown on the previous page. 60% said they wanted to see more frequency and higher ridership than their existing network offers, while 37% said they wanted to see wider coverage than their existing network offers. Stakeholder responses to this choice are shown in the chart at bottom, in Figure 23.

Takeaway: While the Stakeholder Committee expressed modest support for shifting towards higher frequencies and higher ridership, respondents to the web survey expressed a modest preference for wide coverage, similar to the wide coverage provided by the existing network. This suggests that the web survey respondents would not, on average, support reductions in geographic coverage in order to fund higher frequencies or longer spans of service.

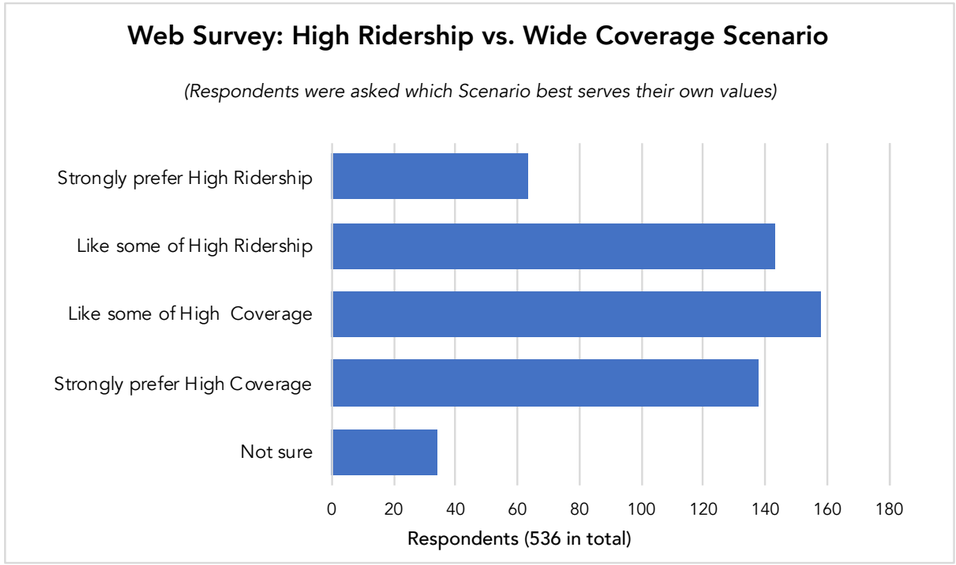


Figure 22: In response to the web survey, slightly more people said they preferred the High Coverage network example than the High Frequency/ Ridership network example.

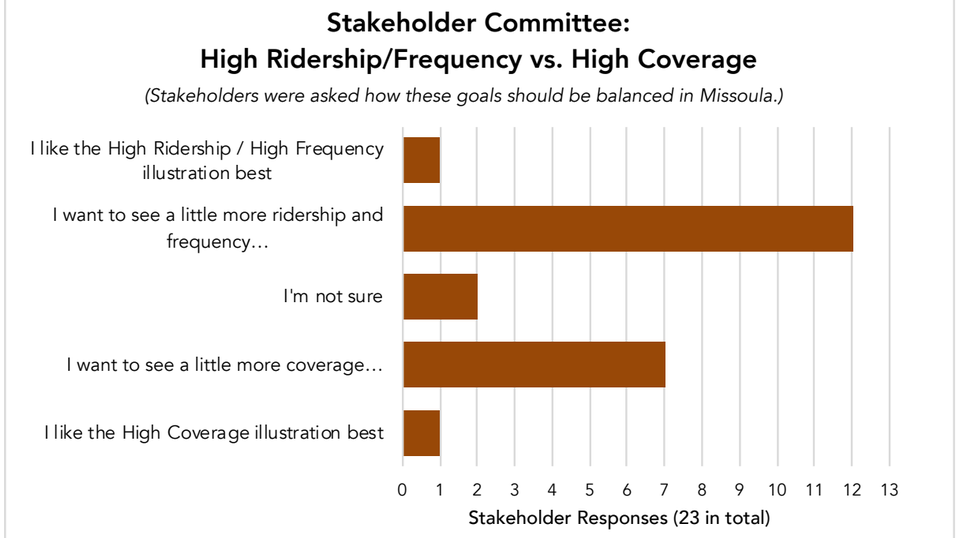


Figure 23: Among members of the Stakeholder Committee, more people wanted to see increases in frequency and ridership than wanted to see increases in coverage.

Capital investments vs. service investments

Members of the public were asked how much they value the three major types of service investment and certain types of capital investments.

Investments in service (coverage, span and frequency) were more popular than capital investments in nicer transit vehicles or improved bus stops. The results of this survey question are shown at top, in Figure 24

Priorities for new funding

We gathered input from the public and transit stakeholders on the relative value of frequency, coverage, span and other transit features by asking people to rank potential service investments.

Web survey respondents were asked to rank their top three priorities for new investment. The three most popular options were:

- More service after 6 pm on weekdays
- Covering places that don't currently have service
- Higher frequency service on weekdays

The chart at right in Figure 25 shows how all of the presented options were ranked, on average, by all respondents.

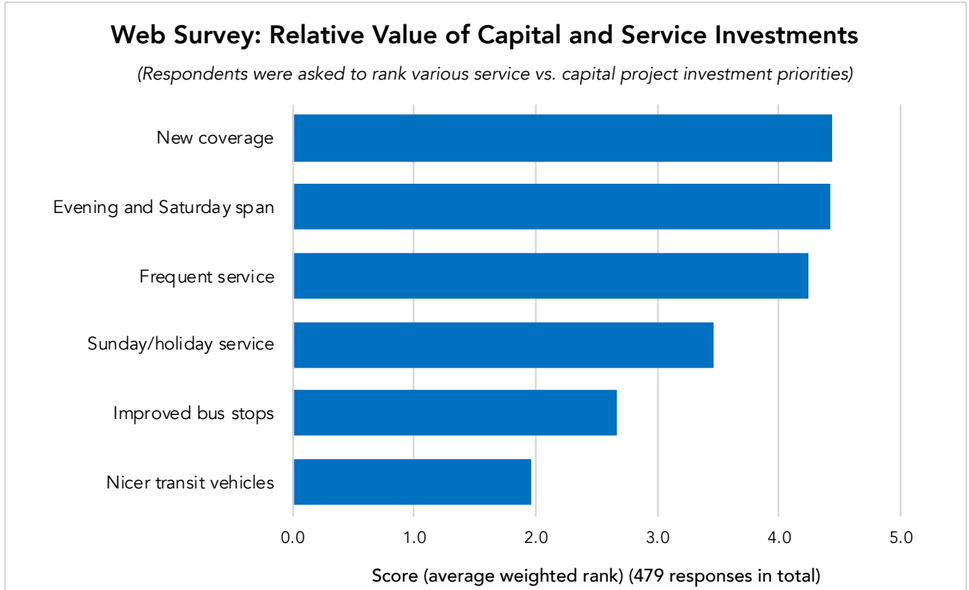


Figure 24: Respondents to the web survey were asked to rank a mix of capital and service investments. Service investments (in coverage, span and frequency) were more popular than capital improvements; improving bus stops was more popular than nicer transit vehicles.

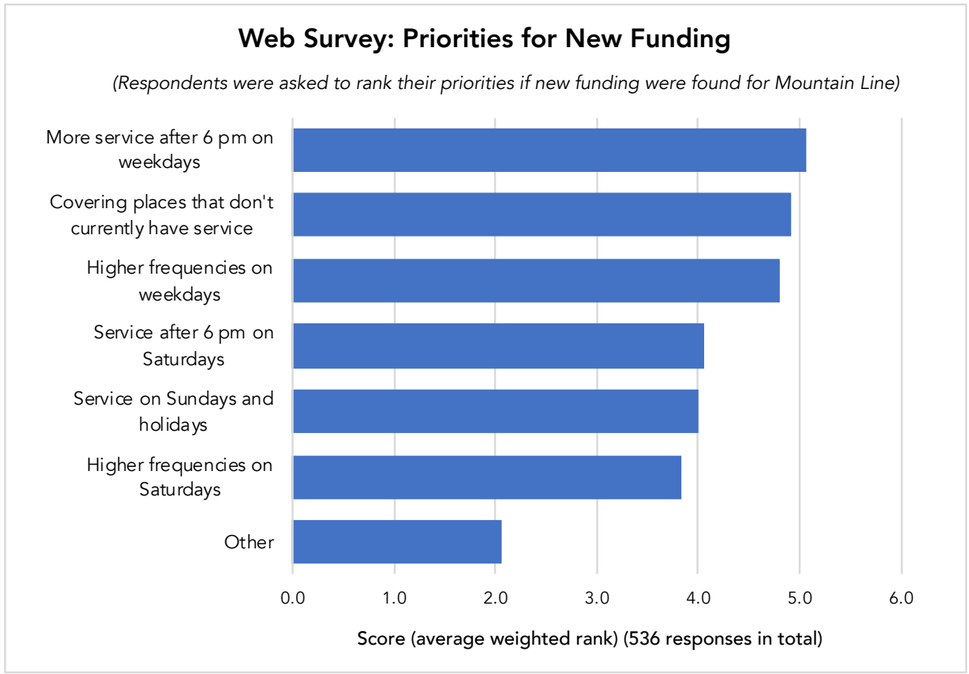


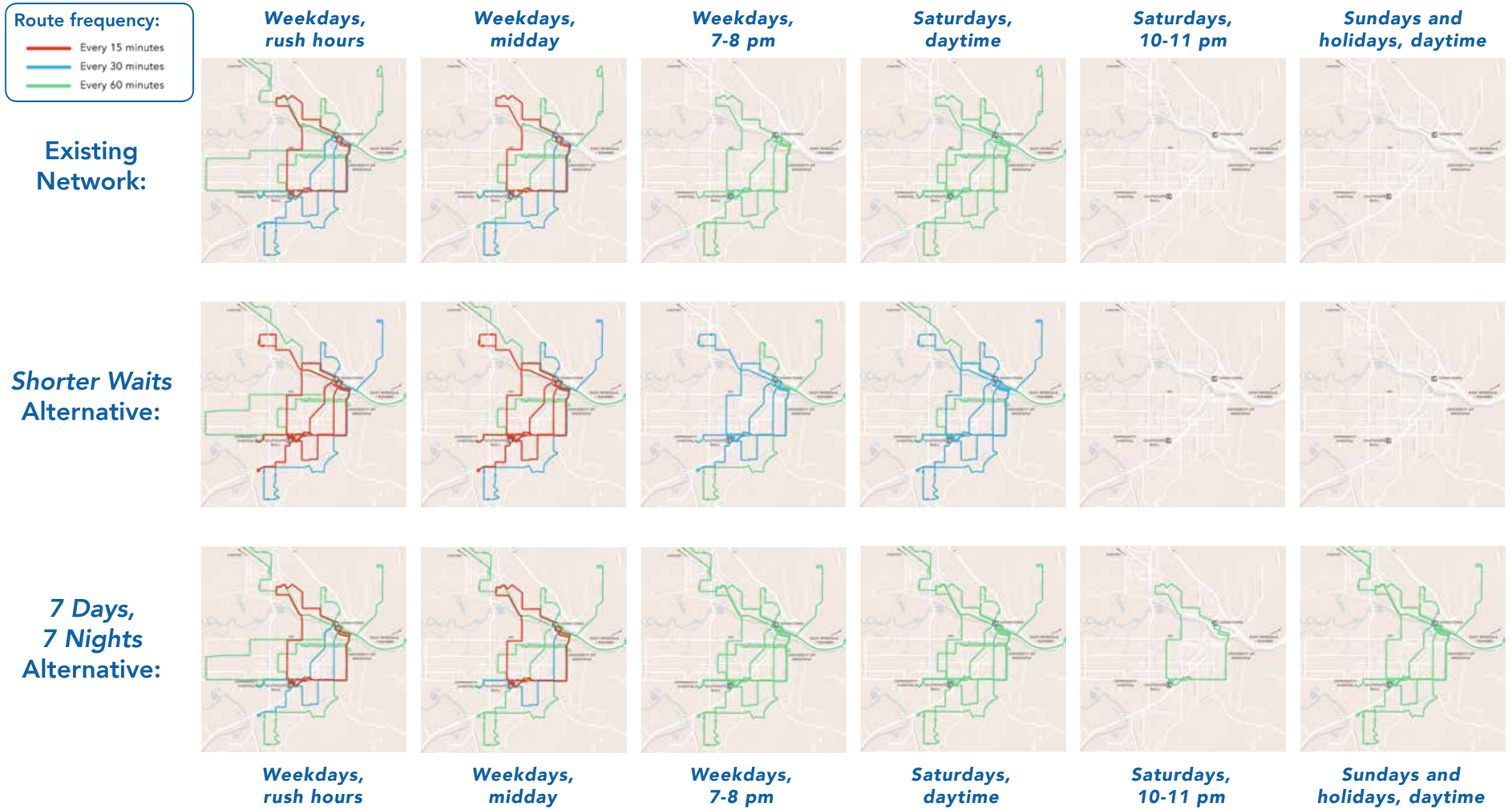
Figure 25: Respondents to the web survey were asked to pick and rank three types of service investment, to reflect their top priorities if Mountain Line were to receive more funding.

In a second round of public input, in Fall 2017, we created two alternative future networks, illustrating how Mountain Line could invest new funding in higher weekday frequencies or in longer spans (including weekend service).

The two future alternatives were called "Shorter Waits" and "7 Days, 7 Nights." The mini-maps at right show how the frequencies and spans of service would change throughout the day and week, compared to the Existing Network.

- The Shorter Waits Alternative would offer higher frequencies on weekdays and Saturdays, but the same short daily spans of service, and no service on Sundays.
- The 7 Days, 7 Nights Alternative would not increase frequencies, but would offer later night service on weekdays and Saturdays, and would add service on Sundays.

By asking people to respond to these contrasting alternatives, we learned how much people value these competing priorities for new funding.



The second general public web survey was conducted in the fall of 2017, and was focused on these two illustrative future alternatives.

In response to a question about which Alternative they preferred, more people said that they preferred the *7 Days, 7 Nights Alternative* (52% of respondents) than said they preferred the *Shorter Waits Alternative* (31%). Responses to this web survey question are shown at top, in Figure 26.

Members of the Stakeholder Committee were asked a similar question in two different ways, at their second meeting.

- They were asked which step Mountain Line should take *first* – extending hours or increasing frequencies – if new funding became available. Three-quarters of the Committee said Mountain Line should lengthen spans first. The results of this poll are shown at middle, in Figure 27.
- They were asked which Alternative they preferred. The majority selected the *7 Days, 7 Nights Alternative*, though a smaller majority than chose "Extend hours of operation" in the previous poll.[3] This result is shown at bottom, in Figure 28.

Takeaway: Among stakeholders and the public, people's top priority for new investment is most likely to be a longer span of service.

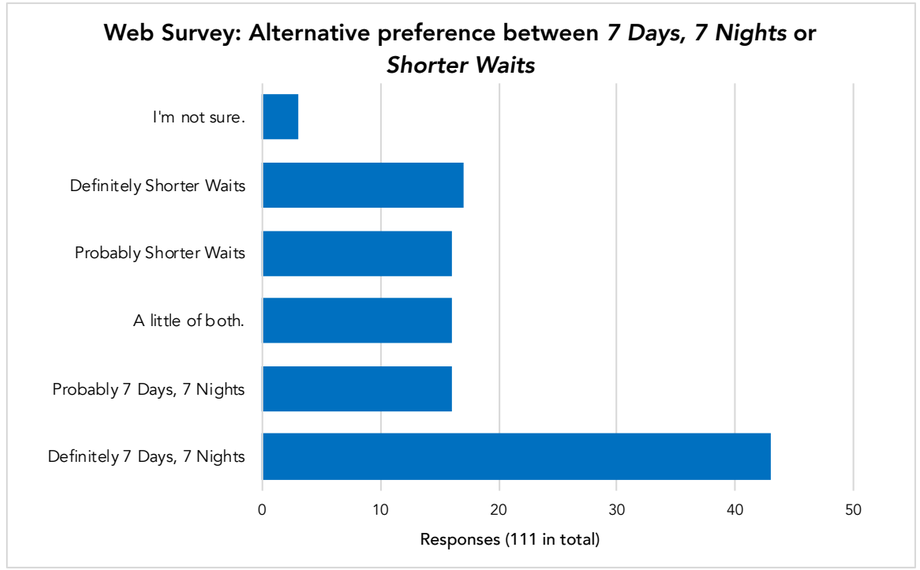


Figure 26: When asked which of two future, higher-funding alternatives they would prefer, by far the greatest number of web survey respondents selected the "7 Days, 7 Nights" Alternative.

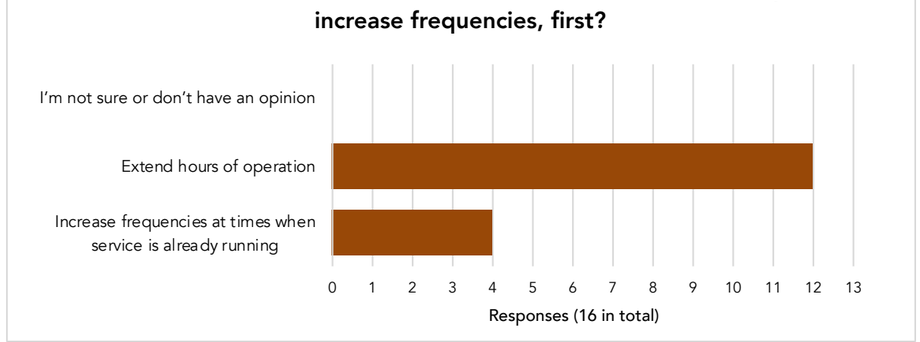


Figure 27: When polled on which step Mountain Line should take first, if new funding became available, most of the Stakeholder Committee chose the lengthening spans (hours of operation).

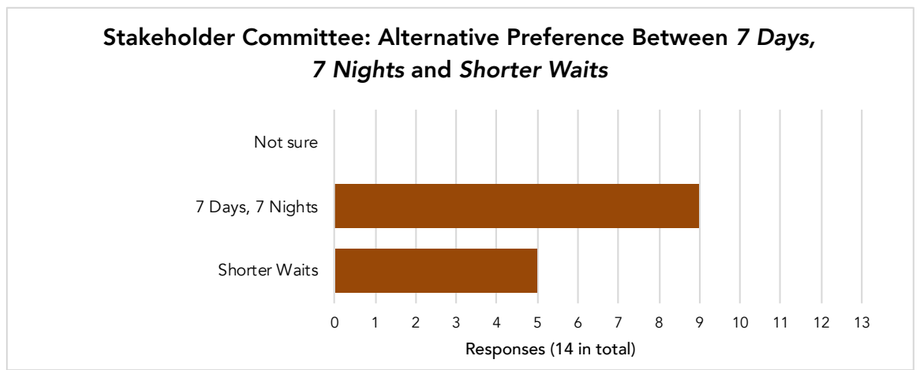


Figure 28: When asked which Alternative they preferred, most members of the Stakeholder Committee chose the "7 Days, 7 Nights" Alternative.

3. Two members of the Committee left the meeting between the first and second polls.

Priorities for span increases

Stakeholders and the public were asked about the relative value of increasing span of service on different days of the week and at different times.

Among web survey respondents, lengthening service hours on Friday and Saturday nights, and on Sundays, was most popular. Responses to this question are shown at top, in Figure 29.

The Stakeholder Committee was also asked to rank times when spans could be lengthened with additional funding in the future. Longer Saturdays and weekday nights were the top two most popular times. These responses are shown at bottom, in Figure 30.

It is difficult to develop precise "takeaway" conclusions from these surveys of the public, because we asked related questions in multiple ways, in two different seasons. A much larger number of people responded to the web survey questions shown on page 23 than to the question on this page. The relative priorities of specific weekend times relative to weekday evenings are difficult to conclude given the change in phrasing of the question.

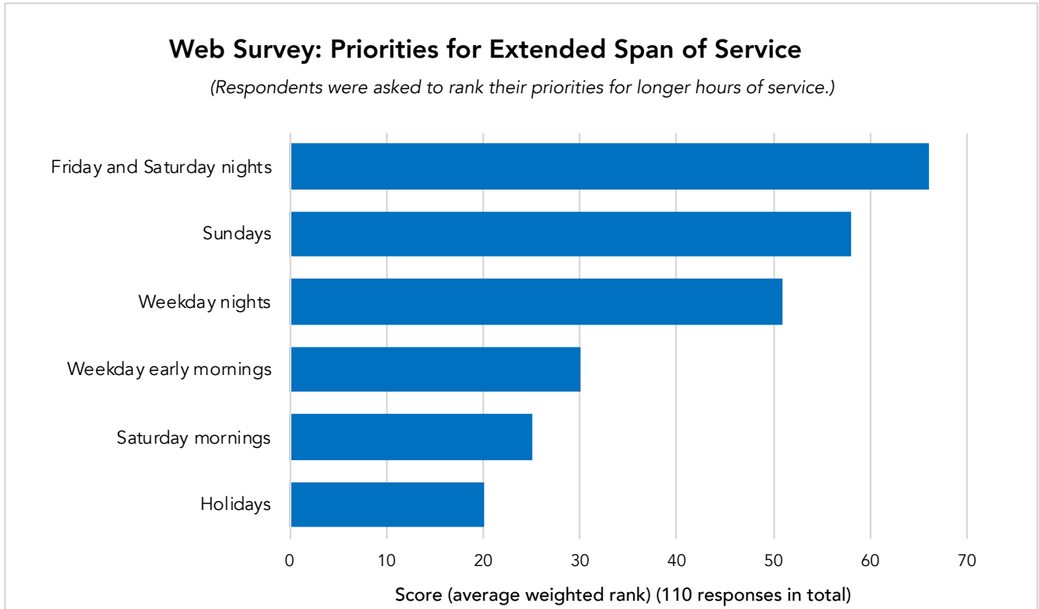


Figure 29: In the web survey, people were asked to rank their top three choices of times when service should be added. Weekend nights, Sundays and weekday nights were the most popular.

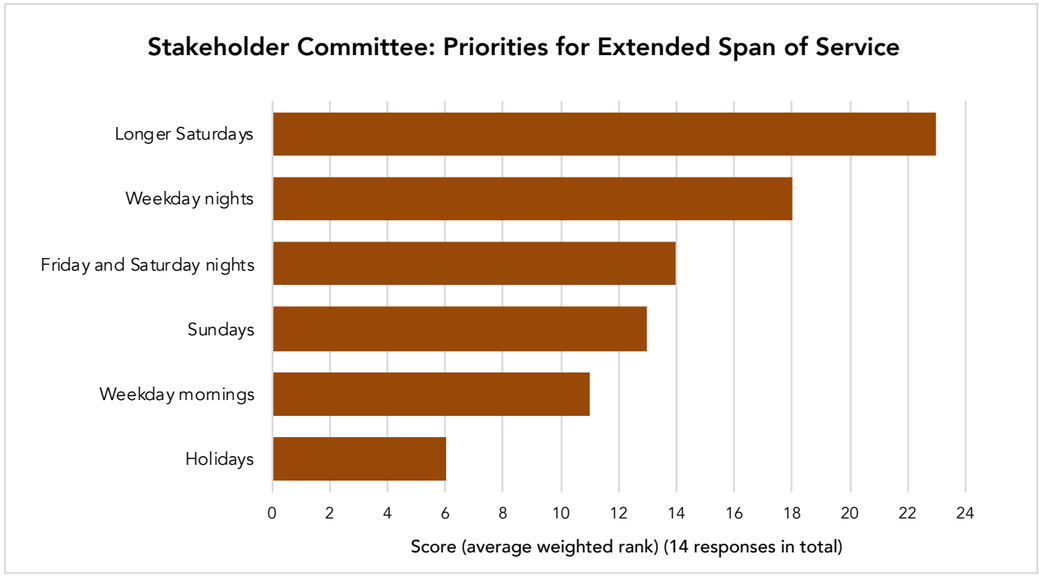


Figure 30: In the web survey, people were asked to rank their top three choices of times when service should be added. Weekend nights, Sundays and weekday nights were the most popular.

Leading or responding to demand

Transit agencies are sometimes asked to invest in transit service on particular corridors or in particular neighborhoods, even though there isn't yet much demand for the service. There is some risk that the transit investment will not meet ridership expectations, if factors outside of the transit agency's control prevent the development from taking place as envisioned. Transit agencies therefore sometimes decline to make "leading" investments in transit service, and instead commit only to responding to demand as it grows.

One place in Missoula where Mountain Line could make a "leading" transit investment is on Brooks Street. As the city and its partners plan for development along Brooks Street, transit is understood to play an important role.

Today, Brooks Street is served by Route 7, which offers low frequencies except during weekday rush hours. Despite this, Route 7 achieves fairly high ridership relative to its cost – comparable to Route 6, even though Route 7 offers people less choice in when they travel.[4] Transit ridership potential along Brooks Street is expected to be higher in the future, once transportation improvements have been made and once there are more residents, jobs and activities close to the corridor.

The public and the Stakeholder Committee was asked whether they thought Mountain Line should be leading development or responding to demand.

- Most respondents to the web survey picked what was presented as the "compromise" option, that most service be focused on existing demand while some service could lead development. A large minority of respondents preferred that no service be spent leading development until that development generates demand.
- Among Stakeholder Committee members, the majority preferred what was presented as the "compromise" option. A larger proportion of the Stakeholders than the web survey respondents preferred that Mountain Line prioritize leading development.

Takeaway: Among the public, enthusiasm for serving areas based on planned development may be low.

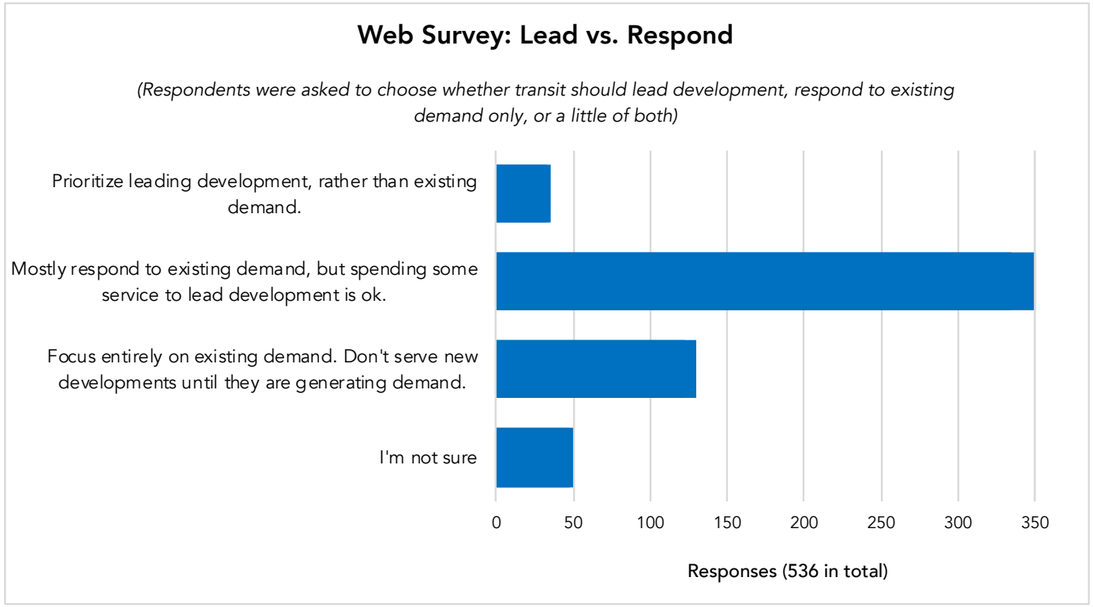


Figure 31: Among web survey respondents, the majority chose the "middle" option, of mostly focusing on existing demands while spending some service to lead development. A sizeable minority expressed a preference that no service be spent leading development.

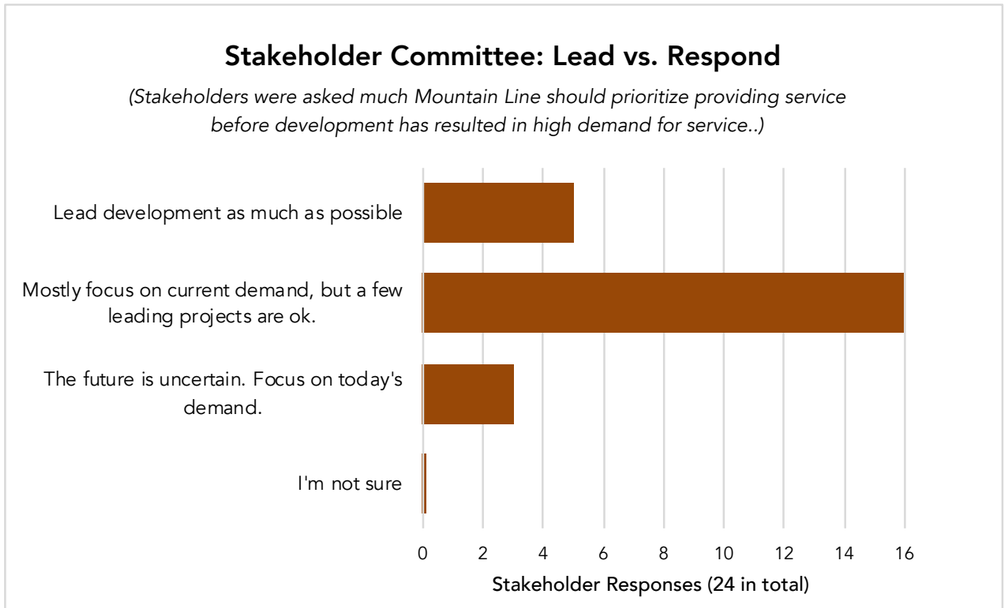


Figure 32: AmongStakeholderCommittee members, the majority said that Mountain Line should mostly focus on current demand; a larger proportion were eager for Mountain Line to prioritize leading development than the proportion of web survey respondents who said the same.

4. In addition, Routes 6 and 7 are somewhat "in competition" for riders, because they serve the same small area south of the river. Anyone who is close to both Routes 6 and 7, and is headed downtown, is better off walking to Route 6 because of its higher frequency. (Similarly, anyone close to Routes 6 and 1, headed downtown, is better off walking to Route 1.)

3 Short-Term Network

This chapter outlines a short-term phasing plan for the Mountain Line transit network over the next five to ten years.

The five phases described on the following pages can be implemented in parallel, as funding and other opportunities permit. However, the operating costs of each phase have been estimated with the assumption that all of the previous phases described in these pages are implemented first.

The phases described later in this chapter require more prerequisites (funding, fleet expansion, engineering changes or capital investments) than the phases described earlier in this chapter.

More detail about the costs of implementing each phase is available in the Appendix on page 68. A text-based table describing each route, its frequency and each span, in the fully-implemented Short-Term Network, is available on page 56.

Phase 1

Service Changes

- **Extend Route 4 Span from peak-only to all-day on weekdays.** With 29.6 boardings per service hour, Route 4 is one of Mountain Line's most productive routes, despite serving low-density, not-very-walkable areas. This is probably because of its high speed, its good reliability, and the long distances its riders need to travel: all make it worth planning one's day around. While the current span may be useful to some 8-5 workers who do not have a need to travel during off-peak times, offering mid-day service will make this route useful to a broader range of people. This all-day span is represented in the chart at right.

- **Reduce Route 11 frequency from 60 minutes to 90 minutes to improve reliability; add one additional daily round trip.** While Route 11 is currently scheduled to operate every hour, it is unreliable and consistently falls up to 15 minutes behind schedule. This is disruptive to riders. Allocating more time for each trip will make it more reliable, especially for connections with other routes downtown. We also recommend adding one more daily round trip (likely later at night). This will make Route 11 an all-day reliable route, with a consistent (but low) frequency, and a longer span of service than it offers today. The new frequency and span of Route 11 are represented in the chart at right.

Operating Cost Impacts

- **$201,000 / year**

- 1,520 service hours[6] / year

Required Capital Improvements

- **Improve major bus stops along Route 4 and 11 ~$370,000** Both Route 4 and Route 11 are likely to see increased ridership after Phase 1. Upgrade the stops with the most boardings to Tier 1 (shelter) or Tier 2 (bench) amenities, as described in the Mountain Line *Bus Stop Master Plan*.

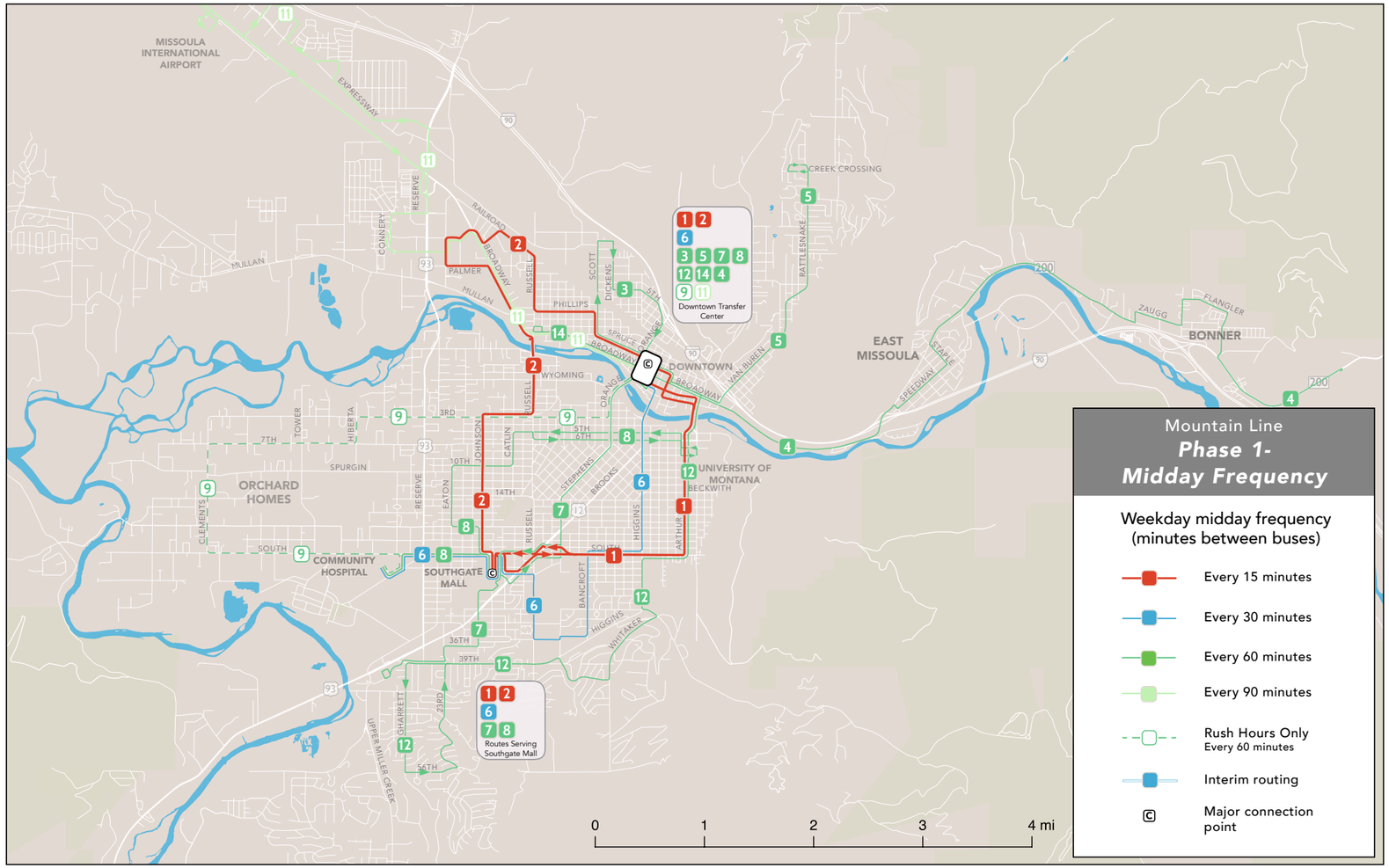


Figure 33: Mountain Line network at the end of Phase 1

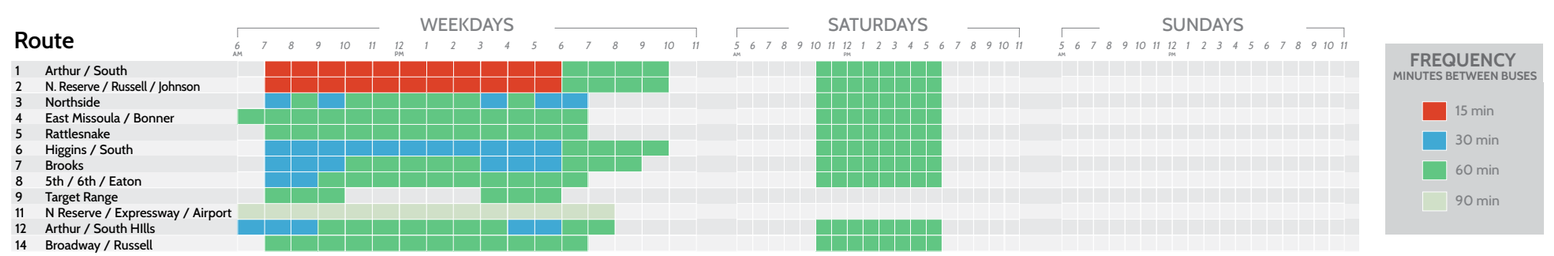


Figure 34: Frequency and Span for each route the end of Phase 1

5. All operating costs are estimated based on Mountain Line's 2018 fully-loaded operating costs of $132 per service hour, and are stated in 2018 dollars.

6. The technical term is "revenue hour of service," which represents one hour of a bus and driver in operation, open to the public, accepting revenue. Revenue hours do not include the time drivers spend getting to the start of a route, which is known as deadhead. In this report we will use the more intuitive term "service hour" instead of "revenue hour", especially since Mountain Line doesn't currently generate revenue from fares.

Phase 2

Service Changes

- **Extend span of service on Saturday and Sunday (no holidays)**
  Currently, Mountain Line offers 8 hours of Saturday service on most routes and no service on Sunday. Phase 2 extends span into the evenings on Saturday and introduces service on Sunday. Improving weekend spans is a priority valued by many stakeholders as detailed in Chapter 2 Public Input on Key Choices.

Operating Cost Impacts

- **$944,000 / year**[7]
  7,140 service hours / year
- **$71,000 / year**
  Required paratransit service

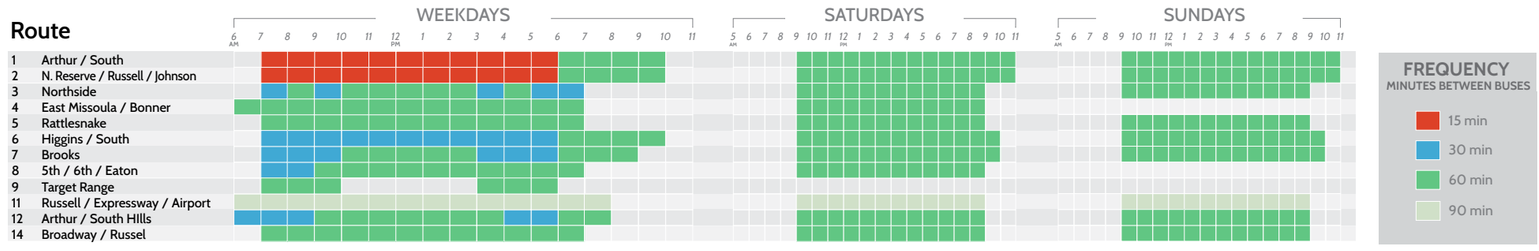


Figure 35: Frequency and Span for each route at the end of Phase 2

Phase 3

Service Changes

- **Extend weekday span of service**
  Begin service at 6 am for all-day routes and operate until at least 9 pm, with Route 7 going until 10 pm and Route 1 and 2 going until 11 pm.
- **Increase morning and evening frequency on Routes 1 and 2**
  Provide 30 minute frequency from 6 to 7 am and 6 to 7 pm.

Operating Cost Impacts

- **$716,000 / year**
  5,330 service hours / year
- **$30,000 / year**
  Required paratransit service

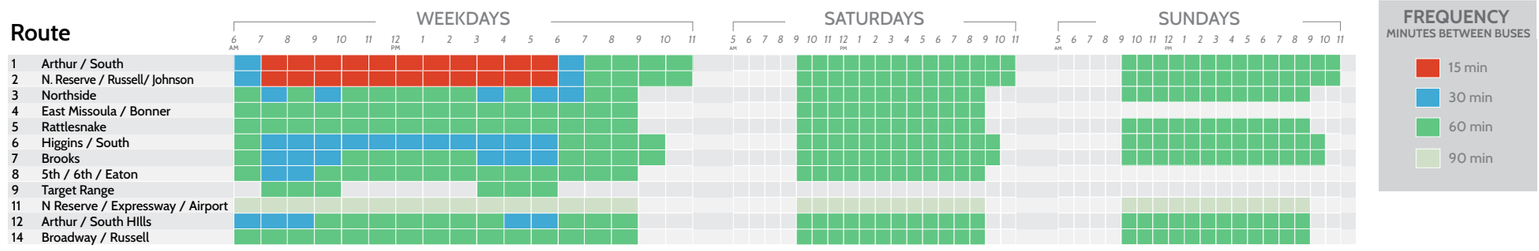


Figure 36: Frequency and Span for each route at the end of Phase 3

7. All costs are in stated in 2018 dollars

Phase 4

Service Changes

- **Introduce 15-minute *Bolt!* Frequency to Connery Way with Route 15; Streamline Route 2**
  Create Route 15 to serve the Captain John Mullan Neighborhood via Broadway, Palmer, Union Pacific, and Connery Way. Remove the diversion of Route 2 to the North Reserve area so it can turn directly from Phillips to Russell. This saves time for passengers traveling between neighborhoods south of the river and the center of the city.

- **Improve directness; add two-way service on Expressway with Route 11; increase frequency to 60 minutes**
  Shift Route 11 to a more direct route that follows Phillips, Russell, Railroad, North Reserve, and Expressway. Replace the existing one-way loop on Expressway and Broadway with two-way service on Expressway, to reduce out-of-direction travel for people going to and from Expressway. Eliminate diversions off of Expressway at Harrier and Wheeler Drive. The more direct routing makes Route 11 shorter, which makes it possible to improve its frequency from 90- to 60-minutes.

- **Remove Route 14**
  The new *Bolt!* Route 15 replaces Route 14 with higher frequency service. Since Routes 3, 5, and 14 are interlined, removing Route 14 helps improve the reliability of Routes 3 and 5, and the reliability of downtown connections between those routes and the rest of the network. It may also make it possible for Route 3 to offer more consistent 30-minute frequency during morning and afternoon rush hours.

Operating Cost Impacts

- **$1,060,000 / year**[8]
  8,030 Service Hours / year

Required Capital Improvements

- **3 additional buses ~$850,000 each**
  Electric buses currently cost about ~$850,000 each, but prices are likely to fall over time. Since Phase 4 increases service during peak hours, these changes will require additional vehicles. Alternatively, other changes that reduce the peak fleet needs, such as a partnership with U-Dash that replaces Route 8, may make Phase 4 possible before additional buses are added to the fleet. See "Fleet Constraints" and "Collaborating with the University" on page 16

8. All costs are stated in 2018 dollars

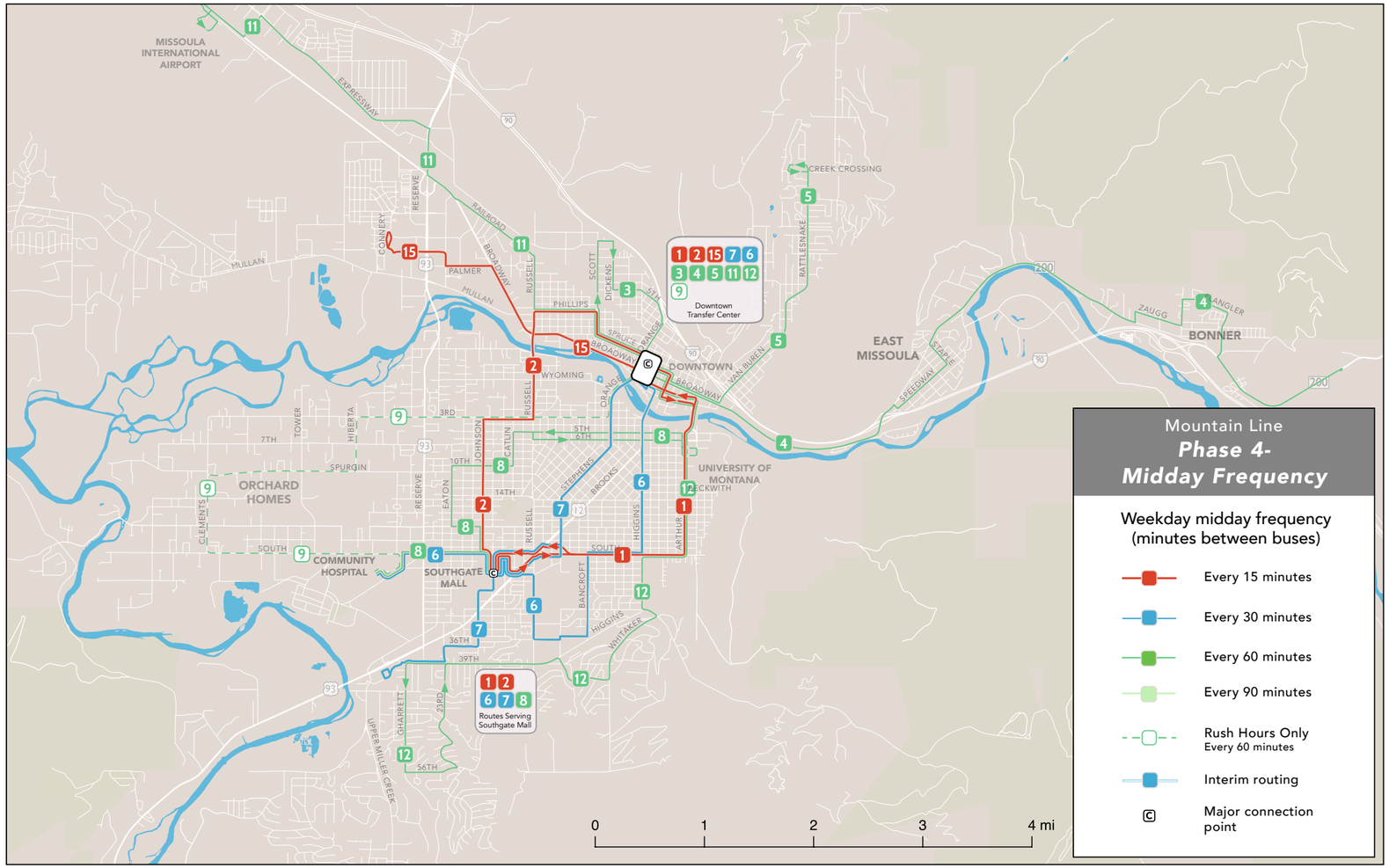


Figure 37: Mountain Line network at the end of Phase 4

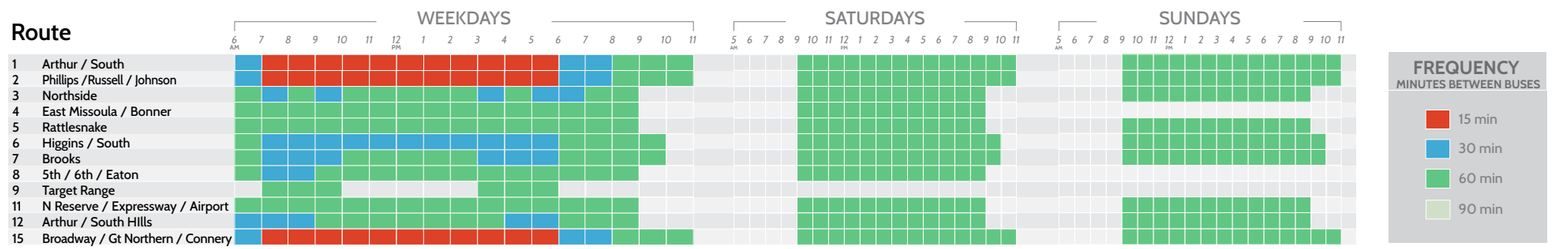


Figure 38: Frequency and Span for each route at the end of Phase 4

for more on this.

- **Expanded bus storage and maintenance facility**
  Mountain Line's current bus storage and maintenance facility is at capacity. An expansion is required before more vehicles can be added to the fleet.
- **Improve bus stops at Russell & Broadway ~$15,000 each**
  With the changes to Route 2 and the new frequent Route 15, Russell & Broadway will become a major connection point.
- **Improve sidewalks and curbs around Russell & Broadway**

Designing stops at Russell & Broadway to make transfers easy and fast

Transit networks that feature a high-frequency connective grid offer the benefit of short waits, but ask passengers to transfer between lines at many locations in the city. These transfers can be made safer and easier with good design.

Wherever frequent, high-ridership routes intersect, stops should be located close to the intersections and have safe crosswalks with short light-cycles. (Traffic engineers often feel pressure to move the bus stops away from the intersection, so that a bus stopping for passengers doesn't interfere with the free-flow of right-turning cars.) Comfortable shelters with good lighting, protection from the elements, and real-time arrival information also make transfers easier.

The investments in a new frequent Route 15 in Phase 4, and the streamlining of Route 2, will mean that travel between the Captain John Mullan neighborhood and the south west quadrant of the Mountain Line network will require a transfer. Two directions of travel are likely to generate the most transfers:

- Northbound on Route 2 to westbound on Route 15
- Eastbound on Route 15 to southbound on Route 2

Transfers in other directions will happen as well, but in smaller numbers. For example, transfers between the northbound Route 2 and the eastbound Route 15 are unlikely because they both go to Downtown.

Mountain Line bus stops are typically placed "far-side": buses drive through the intersection before stopping. However, in cases like this intersection, where a particular pair of directions of travel are likely to dominate, it may be beneficial to place one of the stops on the "near-side" in order to make transfers easier. With this design, illustrated in Figure 39 and Figure 40, passengers can walk off one bus and onto another without crossing the street.

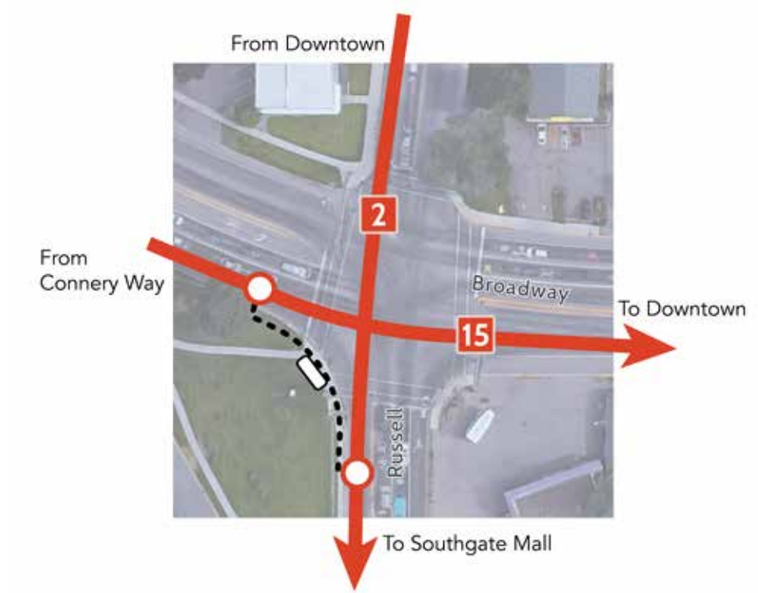


Figure 39: Potential stop locations for eastbound to southbound transfers.

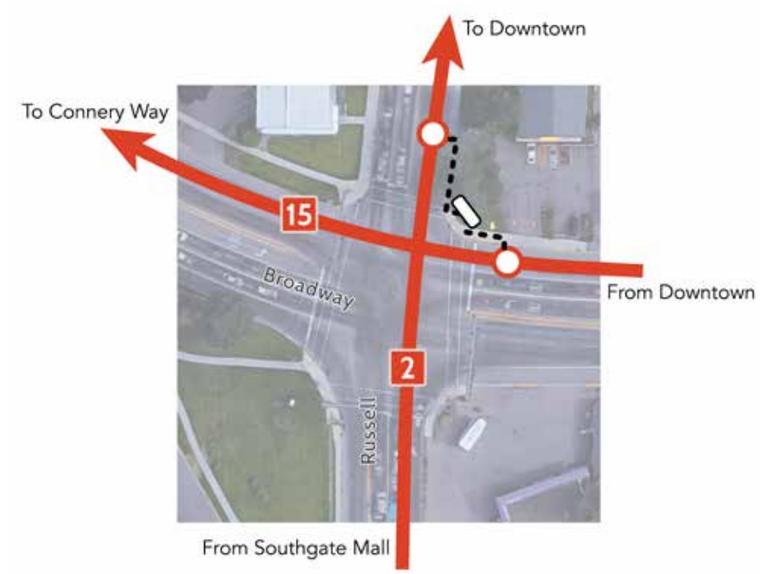


Figure 40: Potential stop locations for northbound to westbound transfers.

Investing in high-quality stops at two corners, rather than four corners, also offers potential cost savings.

It may also be necessary to implement transit signal priority at this intersection to help the buses bypass the queue of cars waiting at the lights on Broadway. A queue-jump light for buses can also help buses pulling away from a stop on the right hand side of the road merge back into the through-lanes.

Brooks Street Redesign

The Brooks Street corridor runs through the heart of Midtown, an emerging district in the center of Missoula, which has seen significant redevelopment projects in recent years.

The amended *2012 Long Range Transit Plan* prioritized increased service along Brooks Street. In 2015, Mountain Line partnered with the City of Missoula, the Metropolitan Planning Organization, the Montana Department of Transportation, the County of Missoula, the Missoula Redevelopment Agency, and the Midtown Association to aggressively work on advancing an innovative transit-oriented development redesign for the Brooks Street corridor to catalyze new opportunities for housing, commercial, and mixed-use development. The end result of this transformative project will make Brooks Streets easily accessible by all modes of transportation.

This phase of the *2018 Strategic Plan* will increase the frequency of service on Route 7 and, over time, move service directly onto Brooks Street, instead of the current slower "stair-step" route on streets adjacent to Brooks Street.

Increasing service and moving it onto Brooks Street depends on many factors outside of Mountain Line's control. This phase could be implemented before or after any of the Phase described on previous pages. Some of the processes and requirements that will affect the timing of this phase are:

- Improvements to pedestrian crossings of Brooks Street. This will allow Mountain Line to run Route 7 on Brooks Street itself, in a direct diagonal path, because people on either side of the road will be able to cross the road to reach the bus stops. Other improvements to the walking environment along Brooks will also support transit access and increase ridership potential.
- Increases in Mountain Line's fleet. As noted for other frequency improvements, higher rush-hour frequencies on any route will require Mountain Line to acquire, maintain and store more buses. Capacity for a larger fleet is currently limited.
- Priority treatments for transit service on Brooks Street. The current expectation is that transit service along Brooks Street will be fast and reliable, and yet will not reduce the number of single-occupancy vehicles that are currently moved along Brooks Street. This may mean, for example, that buses must pull off the road to serve stops, and then merge back into traffic. This causes transit service to be slower (and more expensive to operate) than when buses can simply

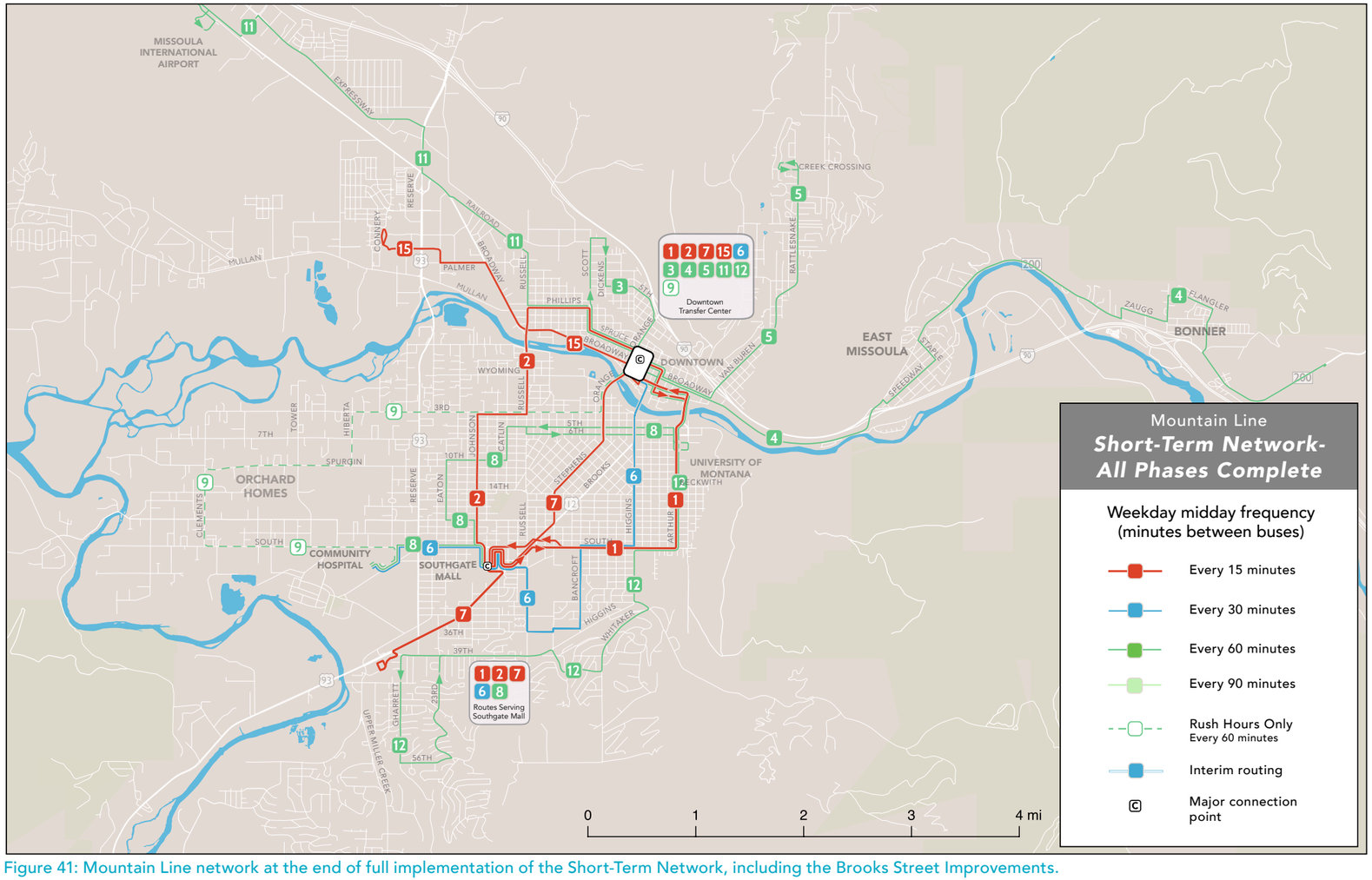


Figure 41: Mountain Line network at the end of full implementation of the Short-Term Network, including the Brooks Street Improvements.

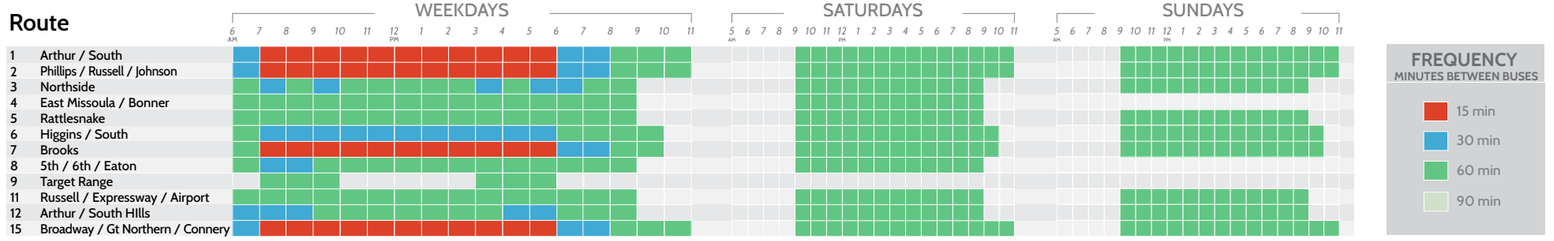


Figure 42: Frequency and Span once the entire Short-Term Network has been implemented, including Phases 1-4 and the Brooks Street Improvements.

stop in the right-most travel lane, as they do in most urban places. Resolving such conflicts among the transportation objectives for Brooks Street will be an essential step in bringing high-frequency, direct transit service to the corridor.

- Availability of operating funding for increased Route 7 service. While the capital projects necessary to improve transit on Brooks Street may be grant funded, such grants do not provide a long-term source of funds to cover the on-going operating costs of higher frequencies and longer spans. The most likely sources of sustainable funding for an increase in Route 7 service are local Missoula sources, just as for the other Phases described in this Short-Term Network.

A text-based table describing each route, its frequency and span, once Phases 1-4 and the Brooks Street Improvements have been completed, is available on page 56.

Service Changes

- **Increase frequency on Route 7 to *Bolt!* levels**
  Route 7 attracts high ridership relative to its cost, likely because it serves a corridor with relatively high densities and a great deal of commercial activity. The Stephens and Brooks corridor is roughly halfway between Routes 1 and 2, and is only close to Route 6 as it approaches downtown, so the service complements rather than competes against other Mountain Line routes.

  For these reasons, the frequency along Route 7 should be increased to every 15 minutes, matching the frequencies of Routes 1, 2, and 15.

- As Brooks Street is brought up to a higher walkable and transit-operable standard, service on Route 7 can be moved onto Brooks (off of the "stair-step" route south of South Ave.) to improve the directness of the route.

  - However, there is a good reason to keep Route 7 on Stephens until Stephens intersects with Brooks: this provides a consistent spacing of north-south frequent routes across the city. Shifting service from Stephens to Brooks would leave a wide gap in coverage between Brooks and Johnson. This gap will ultimately be filled by frequent service on Russell Street, as shown in the Long-Term Network map on page 8. Until that additional north-south frequent route is added, Route 7 should remain on Stephens.

- As an interim step, frequency on Route 7 can be increased to every 30 minutes, all day. This would not require an addition to the bus fleet, because Route 7 already offers 30-minute frequency during rush-hours.

Operating Cost Impacts

- **$970,000 / year**[9]
  7,370 Service Hours / year

- The operating cost of this Brooks Street Improvement is based on 15-minute all-day weekday frequency, and 60-minute frequency on weekends. Interim improvements in frequency and span would have more modest costs.

- Realigning the route onto Brooks Street will shorten it and thereby reduce the cost of any given frequency and span of service. Similarly, transit priority measures can increase the speed of the route and thereby reduce its operating costs.

- Implementing this phase before Phases 2 or 3 would result in lower total operating costs, because higher frequencies and longer daily and weekly spans of service would not yet be applicable to Route 7.

Required Capital Improvements

- **2 additional buses ~$850,000 each**
  These Brooks Street Improvements (to 15-minute frequency) increases service during rush-hours and will therefore require additional buses to operate.

- **Improve major bus stops on Route 7 ~$120,000**
  Upgrade the stops with the most boardings to Tier 1 (shelter) and Tier 2 (bench) amenities, as described in the *Mountain Line Bus Stop Master Plan*. (Such a project might be superceded by a larger corridor-long improvement project.)

9. All costs are stated in 2018 dollars.

Coverage Provided by the Short-Term Network

The Short-Term Network will increase the number of residents and jobs with access to high-frequency services that run 7 days a week.

Increased access to 7-day-a-week service

The Short-Term Network will bring 70 percent of jobs within the Missoula Urbanized Area within 1/4 mile of transit that operates 7 days a week. It will also increase the number of jobs accessible by transit 6 days a week from 68 to 73 percent and increases the number of jobs accessible by weekday-only transit from 73 to 75 percent.

The plan will bring 7-day-a-week transit to 60 percent of residents while increasing access to 6-day-a-week transit from 64 to 66 percent. The share of residents within 1/4 mile of weekday-only service will remain unchanged at 70 percent.

The Short-Term Network will introduce 7-day-a-week transit service to 70 percent of jobs and 60 percent of residents in Missoula.

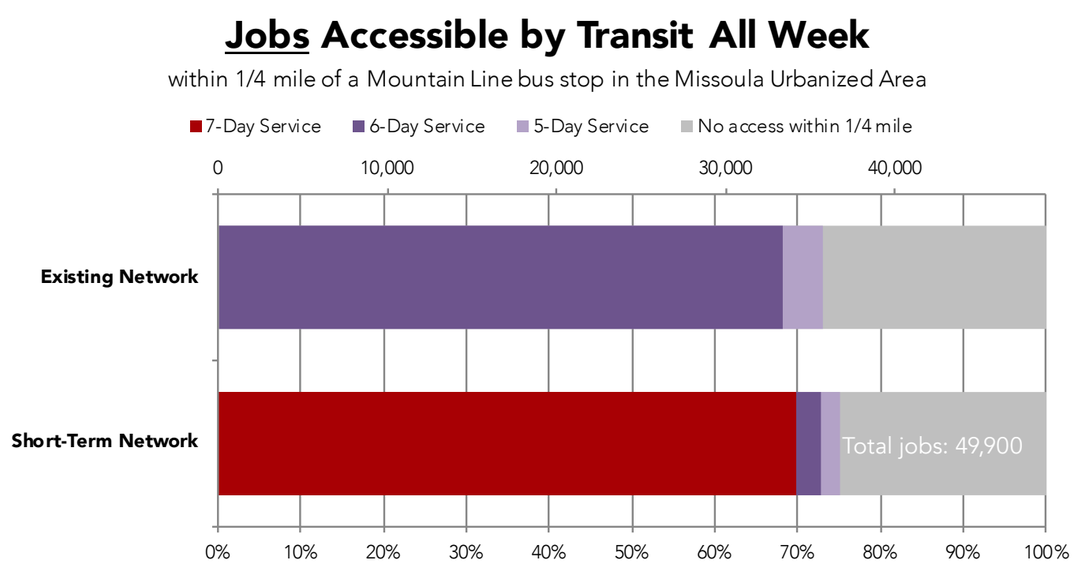


Figure 43: Change in access to jobs within 1/4 mile of 7-day, 6-day, and weekday-only transit. (Longitudinal Employer-Household Dynamics 2014 data)

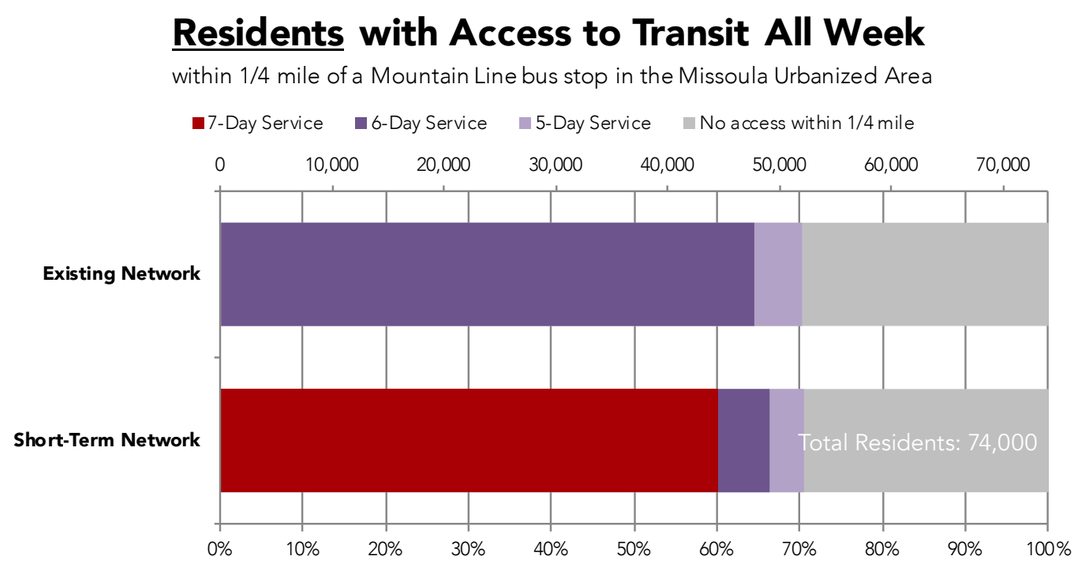


Figure 44: Change in residents within 1/4 mile of 7-day, 6-day, and weekday-only transit. (Longitudinal Employer-Household Dynamics 2014 data)

Increased access to frequent service

The Short-Term Network will increase the share of jobs accessible by frequent, all-day transit from 43 to 52 percent. Frequent service is important because it gives people the freedom to travel at any time without having to depend on schedules. It is also more reliable and allows for transfers between routes with short waits.

The plan will increase the share of residents within 1/4 mile of frequent service from 27 to 34 percent, while the number of residents with access to any transit service will remain unchanged at 70 percent.

As in many cities, Missoula's jobs are more concentrated, and therefore easier to get close to with transit, than are its residences. The Short-Term Network will increase the share of jobs accessible by any transit from 73 to 75 percent.

The Short-Term Network will increase the share of jobs accessible by frequent, all-day transit from 43 to 52 percent while increasing the share of residents with access to frequent, all-day transit from 27 to 34 percent.

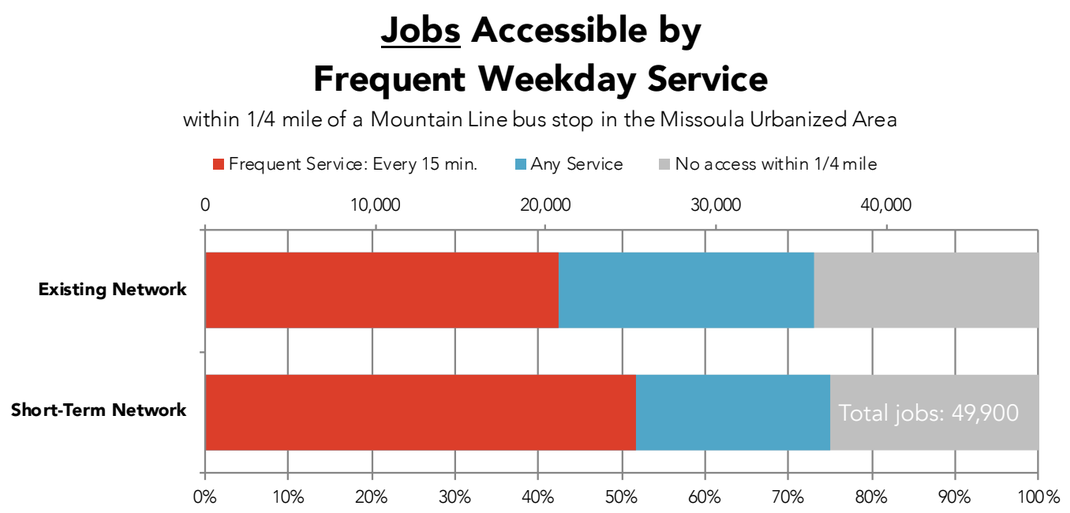


Figure 45: Change in percentage of jobs within 1/4 mile of Frequent, and Any transit service. (Longitudinal Employer-Household Dynamics 2014 data)

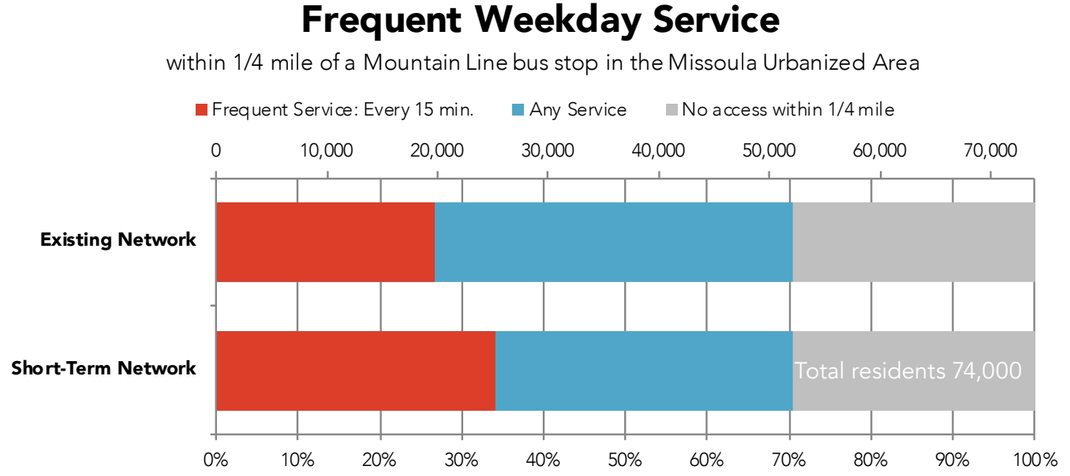


Figure 46: Change in percentage of residents within 1/4 mile of Frequent, and Any transit service. (Longitudinal Employer-Household Dynamics 2014 data)

4 Long-Term Network

Missoula is changing, and the Mountain Line network must evolve with the city.

Local agencies' policies and plans suggest that transit isn't simply expected to chase growth across the valley. Rather, Missoula's growth has been planned in ways that support the success of the existing transit network.

This is a sign of a healthy two-way planning "conversation" between transportation and land use experts. The long-term element of this plan is one statement in that ongoing conversation: a chance for Mountain Line to respond to recent land use plans, explain where transit can succeed in the long run, and show its agency partners where better coordination is needed.

This Long-Term Network was designed with the following adopted plans and goals in mind:

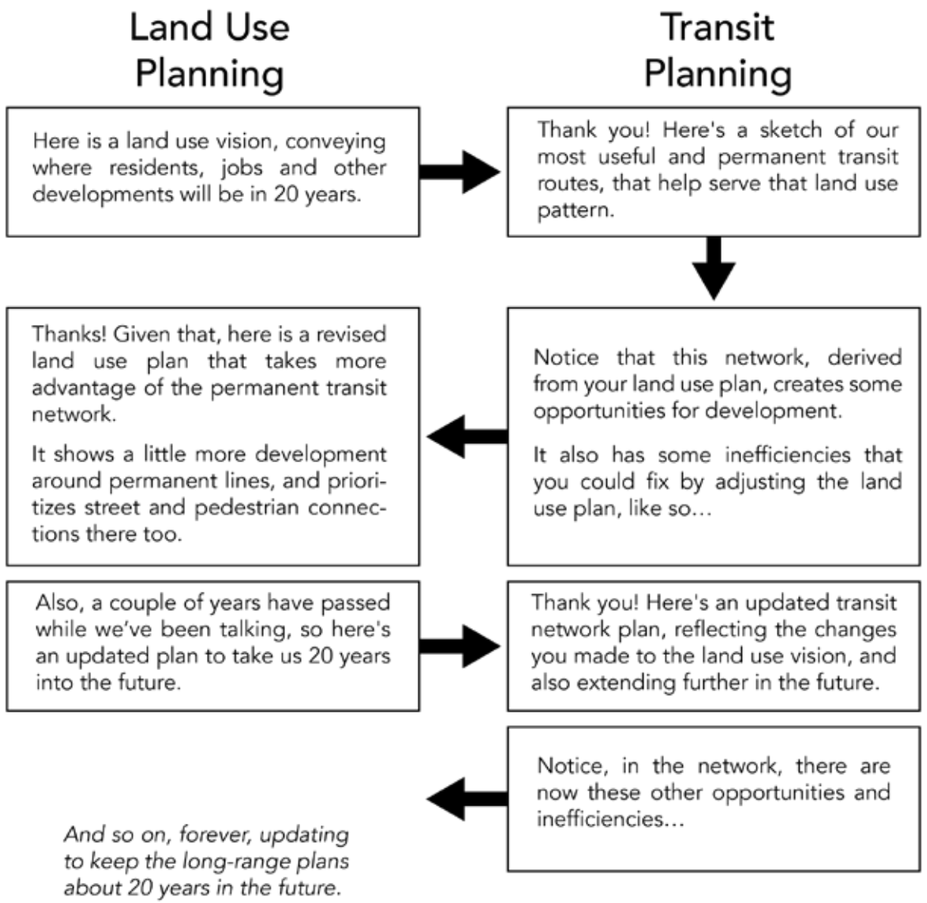
- The *Our Missoula Growth Policy*, adopted by the City of Missoula in 2015.
- The *Long Range Transportation Plan* (covering all transportation modes), adopted by the Missoula Metropolitan Planning Organization in 2017.
- The *Brooks Street Corridor Plan*, written for the City of Missoula in 2016.
- Mountain Line's own previous *Long Range Plan* and short-term *Comprehensive Operational Analysis*, both completed in 2012. In particular, the public input and policy decisions reflected in these plans.

This Long-Term Network will respond to the growth, goals and changes described in these earlier plans, but with respect for the ways that transit can and cannot operate efficiently. Transit is unlike other urban amenities (such as street trees or streetlights or parks) in that it cannot simply be placed wherever it is wanted or needed. A streetlight in one place costs the same amount to operate as a streetlight in another place. A transit line in one place can cost a wildly different amount to operate than a transit line in another place.

Because this Long-Term Network was designed with cost efficiency in mind, some places do not receive service even if modest growth is planned. In this chapter, we describe the ways that the plans listed above informed the Long-Term Network; some areas that are problematic for transit service; and changes that can be made to future growth to improve the success of transit in Missoula.

A Healthy Long-Range Planning Conversation

Similar conversations happen between land use and road planning; between transit and road planning, and for other kinds of related planning activities



Our Missoula Growth Policy

It is difficult to predict where and how development will take place in the long-term because so much hinges on economic conditions and people's preferences for where they live and work, neither of which are predictable more than a few years into the future.

The *Our Missoula Growth Policy* will guide any future growth in the city into a particular geographic shape, will regulate the types of land uses in various places, and will inform the design of private and public spaces where growth occurs.

At right, the map in Figure 47 shows land use designations in the *Our Missoula Growth Policy*, styled to emphasize areas that are likely to generate high transit demand.[10]

> The *Growth Policy* map reveals that the areas bounded by Reserve, Brooks Street and I-90 will have the most transit-supportive densities in the future.

This map shows that most transit-supportive densities are within the area roughly bounded by Reserve, Brooks Street and I-90, though it is a safe assumption that the University of Montana and its student housing to the east of Brooks will also generate very high transit demand.

Most of these areas are not difficult to reach with useful transit, and as a result they receive the most frequent and long-span services in the Long-Term Network. However, some of these areas will be challenging or cost-prohibitive to reach with useful transit, so that even if they are served, ridership will be low.

The challenges that some of these planned dense areas present to transit success are described on the following pages.

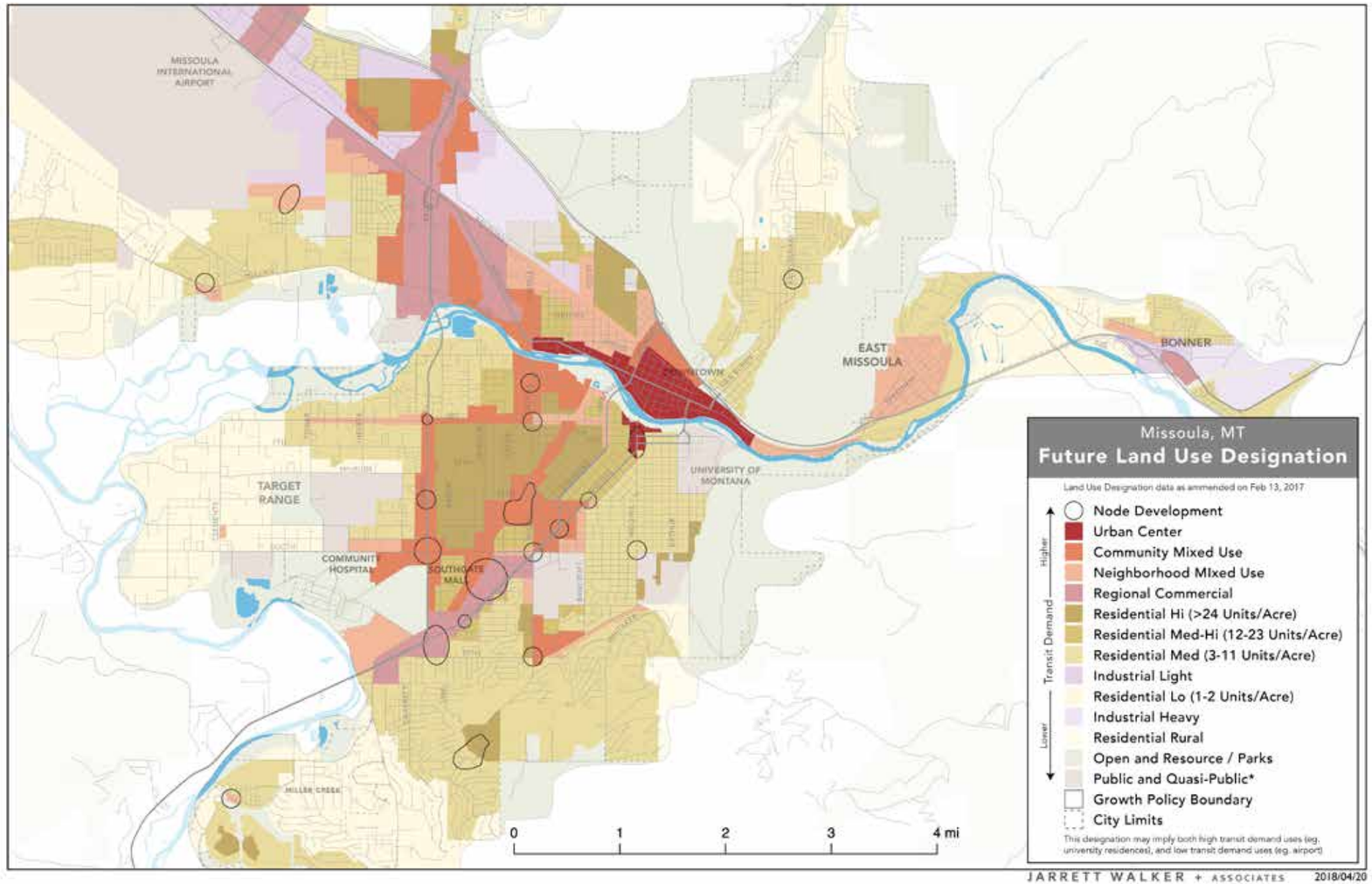


Figure 47: This map shows the *Our Missoula Growth Policy*, styled to highlight land uses that typically generate high transit ridership.

10. "Public and Quasi-Public" areas are shown in a neutral grey tone as it describes ownership instead of density. This classification includes everything from university housing to fairgrounds to the airport so it should be interpreted with nuance. The original version of this map is on page 69.

Some nodes are far away

Density and mix of uses are not, by themselves, sufficient to cause high transit ridership relative to cost. Proximity to other developed areas is essential. Some areas, like Miller Creek, are planned to have a small mixed-use node, but the node is far from any other high-transit demand areas. As shown in the map below in Figure 48, reaching a far-away node requires travelling through areas of low-density (with low ridership). This distance increases the cost of the transit service without a proportionate increase in ridership along the line.

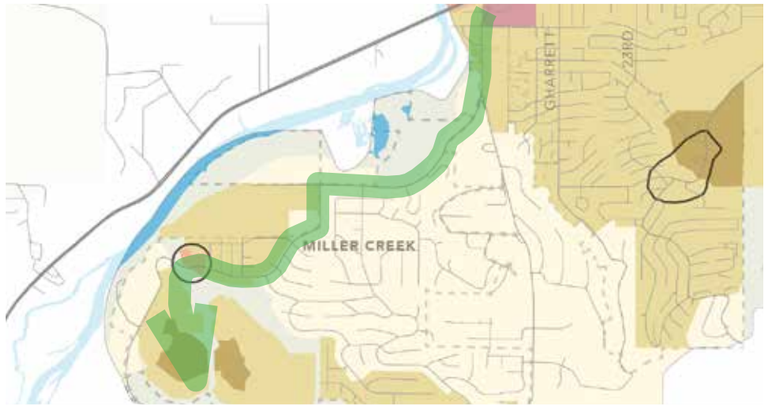


Figure 48: A planned node placed at the very back of the Miller Creek neighborhood would be expensive to serve because it isn't near other high-density areas.

Some dense places are not "on the way"

The *Growth Policy* includes some dense areas that are not arranged in a linear pattern. To serve them with transit, Mountain Line would have to make time-consuming deviations that frustrate riders (and drive down ridership), and that increase operating costs.

Figure 49, at right, shows an example from North Reserve Street where an area designated for "Community Mixed-Use" development featuring higher densities and street-facing retail is located just out of walking distance from North Reserve Street, the nearest linear transit corridor.

While this development's density, mix of uses, walkability and proximity to other developed area can generate high transit demand, its location makes it impossible to serve with a route that is direct on its way to other dense areas. This will force Mountain Line to choose between dividing service into multiple routes, one that goes straight on Reserve Street and one that wiggles over to the walkable neighborhood; or not serving this out-of-the-way development node. Dividing service into more routes always means lower frequencies or shorter spans of service. Wiggling routes tend to be frustrating to through-riders (people who are not going to or from the destination that warrants the wiggle).

Meanwhile, the Reserve Street corridor itself is designated for "Regional Commercial" use, with big-box stores and their parking lots. Single-use, auto-oriented development like this is difficult to serve by transit due to how few destinations are actually within walking distance of any bus stop, and how unpleasant and unsafe it can be to walk there.

Figure 50, below at right, shows an example from south of the Riverfront neighborhood where a "Community Mixed-Use" area is located along an old rail corridor. This rail corridor has no parallel streets that are transit-operable. Some parts of this area are within walking distance of nearby transit lines.

Figure 49: North Reserve Street is the direct line that bisects this developed area, but dense, mixed-use development was permitted just out of walking distance to the west. As a result, Mountain Line cannot serve both of these places with one route, and service to the newer development would have to deviate from the direct path that would be most appealing to potential transit riders.

Figure 50: The "Community Mixed-Use" area south of Riverfront is actually along a freight rail corridor with no parallel transit operable street grid.

Some linear corridors feature undevelopable floodplain on one side, effectively halving the surrounding density

Corridors, such as Mullan Road are linear and direct, but may not yield high ridership due to the fact that one side of the street is a floodplain and cannot be developed. This means that the number of people within walking distance of the corridor is half of similarly dense areas with development on both sides.

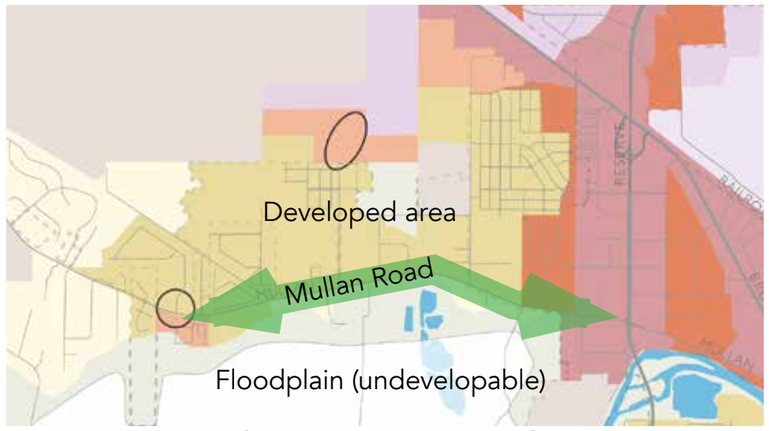


Figure 51: The area south of Mullan Road is designated as a floodplain and is undevelopable.

Some dense areas are nearly un-walkable

Certain areas, slated for densification in the *Growth Plan*, need significant improvements in walkability before they can be safely served by transit. For example, Reserve Street, designated for "Community Mixed-Use," has a five-lane cross section, a 45 mile per hour speed limit and long distances between signals. The Long-Term Network includes service on Reserve Street, contingent upon major improvements in the safety and comfort of walking along and across the road.

Figure 52: Reserve Street (above), has high traffic speeds and volumes, making it unsafe for people to cross the street to access transit in both directions.

Figure 53: Reducing speed limits, adding crosswalks, and adding a median to make Reserve street more closely resemble five-lane Stephens Ave (above), can improve walkability and the potential for transit service.

Figure 54: To reach their full potential as high transit-ridership mixed-use corridors, some streets may require major redesigns that significantly improve the pedestrian experience, reduce car capacity, and protect transit from congestion. (Above example from NACTO Global Street Design Guide, 2017.)

Coverage in Low-Demand Areas

If the Mountain Line system were designed *only* for maximum ridership, it would follow the "Ridership Recipe" as described on page 13, focusing on areas where there are many potential riders and little additional operating cost is needed in order to reach them.

Yet maximizing ridership is not the only goal of public transit systems. Public transit is almost always expected to meet other goals. In nearly every city, there is an expectation that transit service should be provided in some or all places regardless of the ridership it attracts.

In 2008, the City of Missoula updated its land use plans, with overwhelming public support for a "Focus Inward" approach to growth. In 2012, Mountain Line's short-range plan was updated to complement this "Focus Inward" growth plan. Since then, Mountain Line has implemented phases of the "Focus Inward" strategy, increasing frequencies and spans of service on existing routes. These investments increased ridership and productivity (ridership relative to cost) on the system, and increased the relevance of transit in the life of the city.

High ridership, high frequencies and long spans have been a focus for Mountain Line since adoption of the 2012 plan. However, like all transit agencies, Mountain Line regularly hears from stakeholders and community partners who want to see transit service deployed in ways that do not maximize ridership, but are valued nonetheless.

This Long-Term Network will maintain all existing coverage, even along routes where ridership is low, but it does not include significant expansions of coverage to low-density or distant areas. The map at right in Figure 55 shows two types of "coverage" areas and sets expectations for future transit service there:

- Shown in orange are those areas where ridership is low today and there is little or no planned future growth according to the *Growth Policy*. In these areas, Mountain Line is likely to maintain service for the foreseeable future, but is unlikely to increase service levels substantially.
- Shown in pink are areas that are not currently covered by service, where the *Growth Policy* does not indicate future high densities, but where coverage may be desirable in the future. These areas can be covered in the future if the built environment changes in ways that make transit more cost-effective.

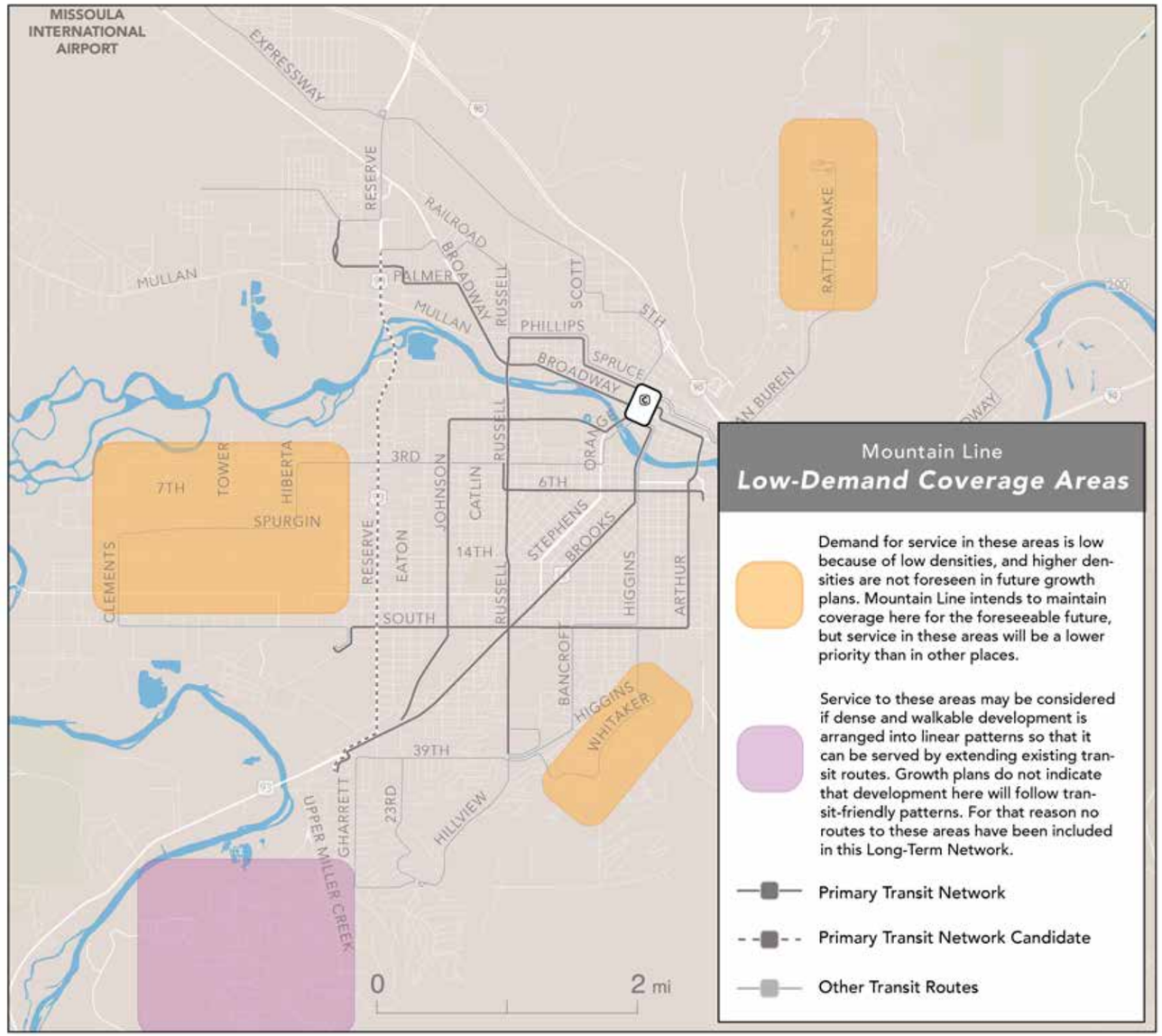


Figure 55: This map highlights areas of Missoula where little or no dense growth is planned and that are not on the way to other areas generating transit demand.

2043 Long-Term Network

The 2043 Long-Term Network will respond to the city's planned growth and transportation, improving transit in the areas where ridership will be highest relative to costs. It will provide about 2.5 times as much service as the existing Mountain Line network, using 140,100 hours of service per year (rather than the 57,700 hours required to operate the existing network).

A text-based table describing each route, its frequency and each span, for the Long-Term Network, is available on page 57.

> The 2043 Network provides about 2.5 times as much service as the existing Mountain Line network.

One of the key features of this network is its frequent grid. A frequent grid only becomes possible if:

1. Mountain Line is able to invest in considerably more service, and
2. Those investments are made in higher frequencies and longer spans in the densest and most walkable parts of the city.

A frequent grid (shown in red in the map at right) allows someone to go from anywhere to anywhere on the grid, with a single fast transfer.

In addition to the frequency improvements already described in the Short-Term Network, this Long-Term Network will include:

Expanded *Bolt*! Frequent Service

- **Route 1: 7.5-minute frequency along Arthur**
  Very high frequency service will link Downtown with Arthur Avenue and University of Montana residences at South Avenue.
- **Route 19: Wyoming and Johnson**
  If Johnson Street is not yet completed between 3rd and Wyoming, interim routing is along Catlin and 3rd. This route will require a new local street near Southgate Mall.
- **Route 2: Russell**
  With a new route serving Johnson Street, Route 2 can offer direct service along Russell Street.

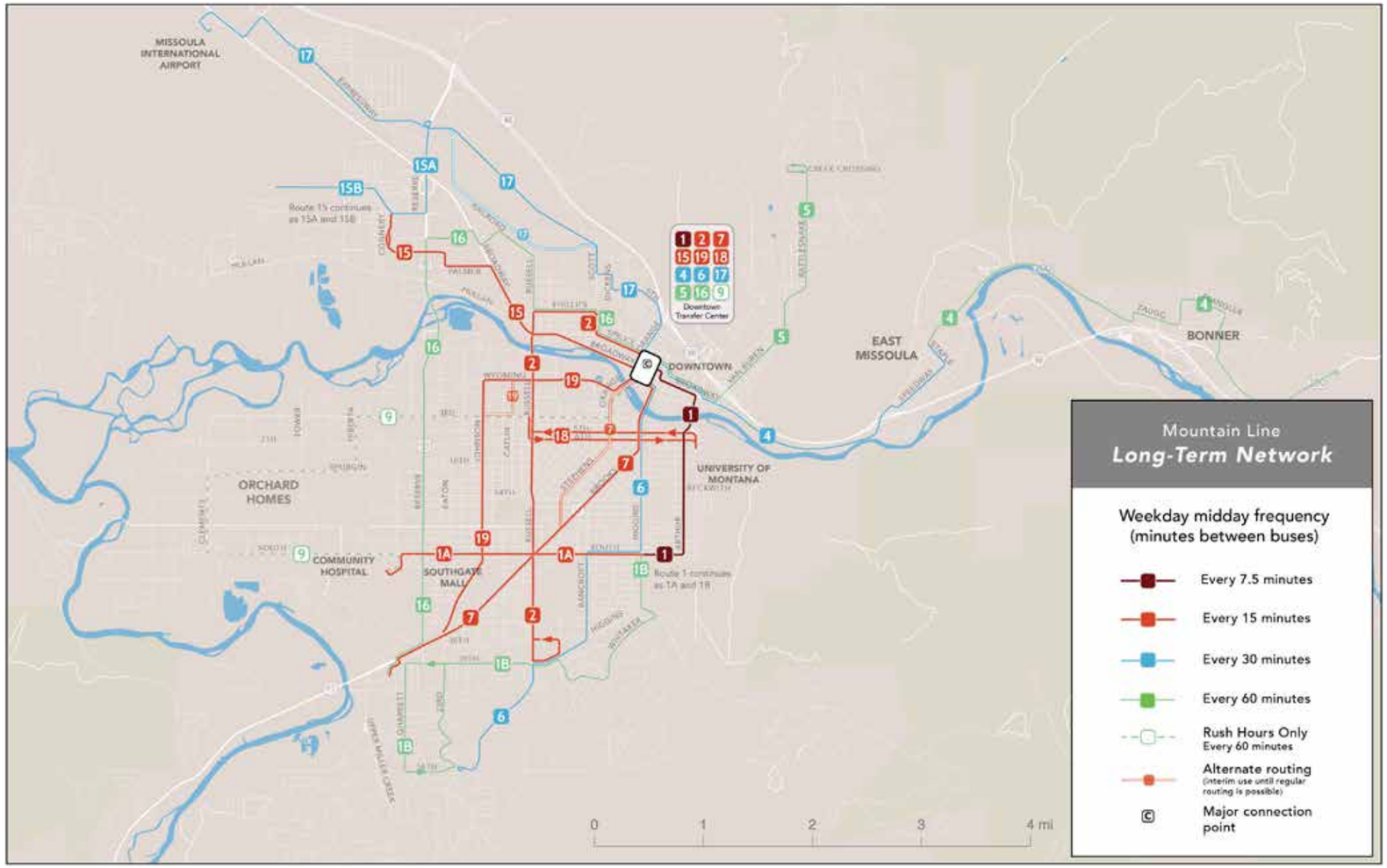
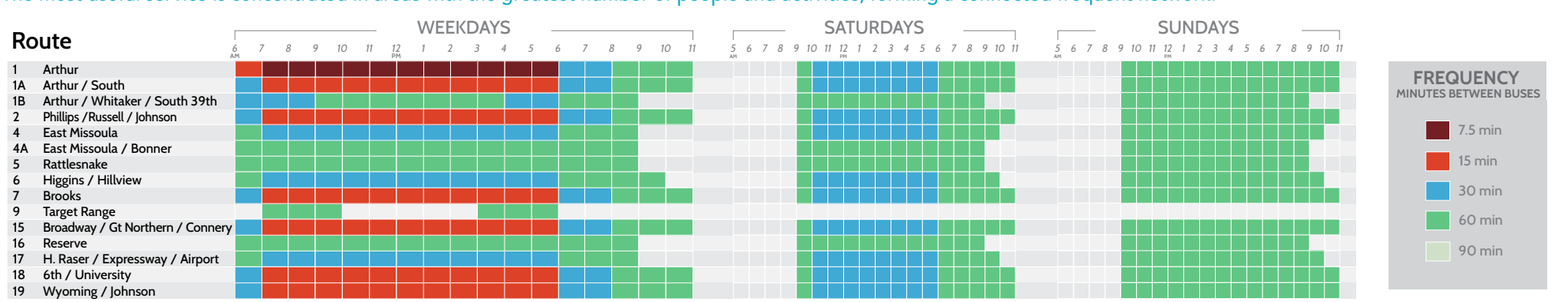


Figure 56: The 2043 Long-Term Network responds to the *Our Missoula Growth Policy* and the ambitious transit mode-share goals in the regional *Long Range Transportation Plan*. The most useful service is concentrated in areas with the greatest number of people and activities, forming a connected frequent network.



11. In estimating costs, we have assumed that increased urbanization and traffic congestion result in a 10% reduction in operating speeds. Due to inflation, the cost in future dollars is likely to be more than 2.5 times the dollar cost of operating the existing network.

- **Route 18: 6th Street**
  The Long-Term Network includes frequent two-way service on 6th Street (which is presently one-way). This year-round route can be operated in partnership with U-Dash.

- **Route 1: Now to Community Hospital**
  Route 1 will be extended along South Avenue to the west, terminating at Community Hospital.

Increased Frequency on Other Routes

- **Increased frequency to East Missoula**
  Route 4 frequency will be increased from 60-minutes to 30-minutes between Downtown and East Missoula.

Straighter, More Direct Routes

- **Route 7 will move on to Brooks to improve directness.**
  The slow, "stair-step" routing south of Southgate Mall will be replaced with direct routing on Brooks Street once pedestrian improvements are made to the street. This also creates more even-spacing between Bolt! routes, so they are not competing with one another and instead are maximizing the number of people who can be walking-distance from a short wait for service.

- **Straighter, more direct routing for Routes 1, 2 and 7 around the intersection of South and Russell**
  The complex intersection and routing pattern into and out of Southgate Mall adds non-productive travel time to transit trips. Routing through this area will be made more direct if the intersection is simplified, two-way streets are restored, and a transfer center is built near the intersection.

- **New 30-minute service between Downtown, Northside, North Reserve and the Airport**
  This line will follow interim routing along Cemetery Road until Howard Raser Avenue is extended (as planned in the *North Reserve Scott Street Master Plan*, shown on page 71). This route will eventually replace Route 3's one-way loop with two-way service, reducing out-of-direction travel for people in the Northside neighborhood. It will also replace Route 11 on Expressway and at the airport.

New Coverage of Dense Growth Areas

- **New service along England Boulevard and on North Reserve**
  Route 15 is extended with two branches. One branch returns to Reserve Street to connect with Expressway while the other branch extends to a dense, mixed-use area planned at the north end of George Elmer Drive. This routing is based on planned street connections in the West Broadway / Mullan Rd. area (the planned street network is shown on page 70).

  Note that historical service on Mullan Road was removed due to extremely low productivity and high cost per ride. In the future, service along Mullan Road can be expected to have low productivity, because half of the area covered by the route is a floodplain and will always be undeveloped. Instead of skirting around the neighborhood's perimeter on Mullan Road, the Long-Term Network's Route 15 on England Boulevard bisects the neighborhood, getting within walking distance of more people. It will be essential to have connected streets or pedestrian paths from developments on Mullan Road to transit-operable streets to the north, so that residents on Mullan Road have access to transit.

Instead of skirting around the Capt. John Mullan neighborhood on Mullan Road, Route 15 along England Boulevard bisects the neighborhood to get within walking distance of more people.

- **New service on Hillview Way**
  Service can be introduced to Hillview Way to reach a planned dense residential node.

- **New route on North and South Reserve Streets**
  Reserve Street is planned for dense "Community Mixed-Use" development. This will be served by a new 60-minute frequency route, terminating in Downtown and at Community Hospital. This service is contingent on changes to traffic engineering and pedestrian infrastructure improvements on the corridor. The potential for transit service on Reserve Street is discussed in further detail starting on page 49.

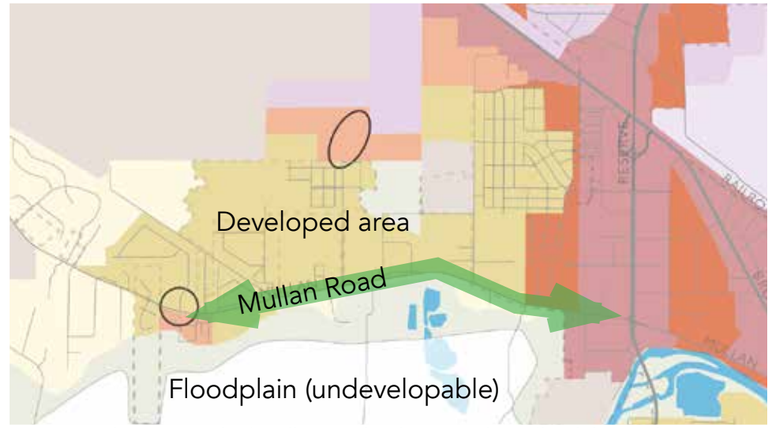


Figure 57: The area south of Mullan Road is designated as a floodplain and is undevelopable, which means that a transit service on Mullan Road itself serves many fewer households and destinations than transit service bisecting the neighborhood, north of Mullan Road. For developments and destinations on Mullan Road, pedestrian access to streets just to the north will be essential to transit access.

Long-Term Capital Improvements

Some transit service improvements in the Long-Term Network require infrastructure and capital projects be completed as a prerequisite. Those infrastructure projects that have a geographic locations are mapped in Figure 59 at right, and are listed (not in order of priority) below.

1. **Improve Brooks Street pedestrian crossings**
   Route 7 currently follows a slow "stairstepping" route south of Southgate Mall due to poor pedestrian access across Brooks Street. Adding pedestrian crossings at regular intervals will allow Route 7 to operate in a straight, direct path on Brooks instead.

2. **Improve pedestrian access along South Russell Street**
   Adding crosswalks, curb extensions, or median pedestrian refuge islands along Russell Street supports service by *Bolt!* Route 2 along this direct, straight path through dense development.

3. **Simplify South and Russell intersection**
   The six-way intersection at South and Russell, and the one-way couplets there, make transit more expensive and less useful. Transit routes are longer, more complex, and their one-way routings mean that some people are a short walk to transit for a trip in one direction, but a long walk in the return direction. Transit can be made even more attractive if it receives priority treatments through the intersection.

4. **New street connection through Southgate Mall area**
   A new north-south street through the Southgate Mall area increases the directness of the future Route 19 (along Johnson) and allows it to serve planned dense developments on Brooks Street.

5. **New South Transfer Center**
   A new transfer center located close to the intersection of Russell and South will improve travel times along Routes 1, 2, and 7 by replacing circuitous routing around Southgate Mall. At time of writing, Mountain Line is in the process of selecting a site for this Transfer center.

Figure 58: The South & Russell intersection.

6. **Traffic signals at Orange and Cregg**
   This signal is needed for the future *Bolt!* Route 19 to turn left from Cregg Lane onto Orange Street.

7. **Extend Johnson Street between 3rd and Wyoming**
   This new section of street allows the future Route 19 to remain on Johnson and Wyoming. 3rd street is also more favorable for transit ridership as it is designated for "Community Mixed Use."

8. **Extend Howard Raser Avenue from North Reserve to Northside**
   This allows a transit route to bisect the developable area instead of using Cemetery Road; bisecting a developed area maximizes the number of people near transit and therefore increases ridership. Running along the perimeter of a developed area (such as along Cemetery or Mullan Roads) means only 1/2 of the nearby area can actually make use of the service.

9. **Add pedestrian crossings on South Reserve Street**
   South Reserve is five-lanes wide, with high automobile speeds and few opportunities for pedestrians to cross. Safe and convenient crossings at regular intervals must be added before transit service is feasible on the corridor. At time of writing, funding for such improvements is being sought by the City, the State and the Missoula Redevelopment Agency.

10. **Improve pedestrian crossings at Missoula College and nearby apartments on East Broadway**
    Without pedestrian crossings, people living or going to school along the highway can't safely reach the bus stop on the other side.

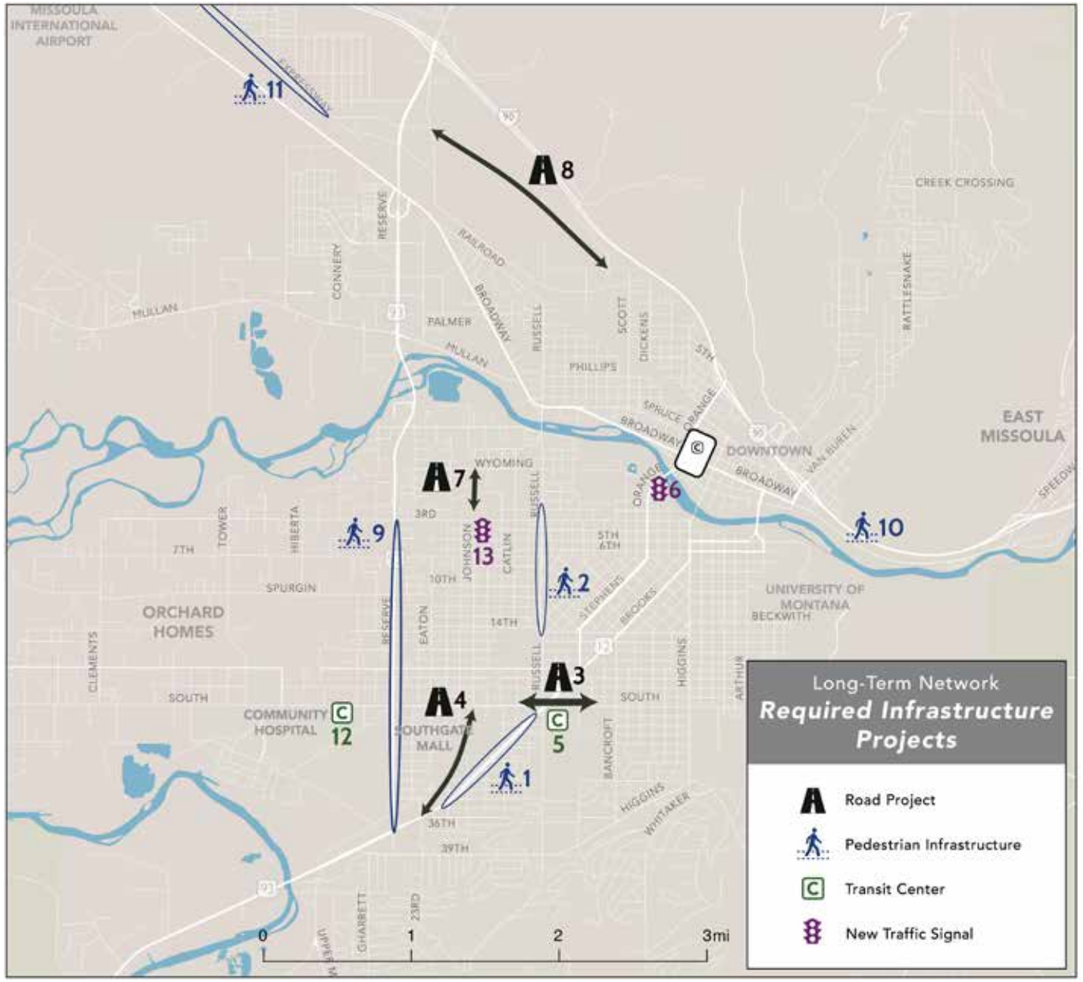


Figure 59: Geographically-specific infrastructure projects required for the Long-Term Network.

11. **Complete sidewalks on both sides of Expressway and add pedestrian crossings at regular intervals**
    Sidewalk and crossing improvements allow safer access to Route 17, which will remain on Expressway instead of making time-consuming deviations into and out of the neighborhood.

12. **New transit entrance on the north side of Community Hospital**
    A more direct entrance from the north allows for a faster and more reliable service, saving Mountain Line operating dollars and saving passengers time.

13. Traffic signal at 3rd and Johnson
This signal is needed to allow the future Route 19 (Johnson) to cross 3rd Street.

Some capital projects are not geographically-specific and are therefore not shown on the map on the previous page. They are nonetheless essential to the success of the Long-Term Network.

- **Expand fleet by approximately 13 buses**
  The Long-Term Network will require 11 more vehicles in active service than will the Short-Term Network. To maintain reliable service, Mountain Line will also need two additional vehicles as spares. If the 6th Street *Bolt!* service is operated in partnership with U-Dash, and the two organizations share fleets for that service, the necessary fleet expansion may be slightly reduced.

- **Improve high-ridership transit stops along the Primary Transit Network**
  The Primary Transit Network (PTN) is the set of streets on which Mountain Line is expected to offer frequent and/or high-ridership service 25 years from today. (The PTN is described in the next chapter.) A continual effort will be required to upgrade bus stops on the Primary Transit Network in accordance with the 2015 *Bus Stop Master Plan*. High-ridership bus stops will receive Tier 1 (shelter) or Tier 2 (bench) treatments, potentially with improvements to street crossings, sidewalks and curb ramps.

- **Implement Transit Priority Measures through all pinch-points on the Primary Transit Network**
  As Missoula grows, bus-only lanes and transit signal priority are necessary to prevent speed and reliability from deteriorating with increased traffic congestion. The map at right, in Figure 60, shows where peak congestion is expected to be worst in 2045.

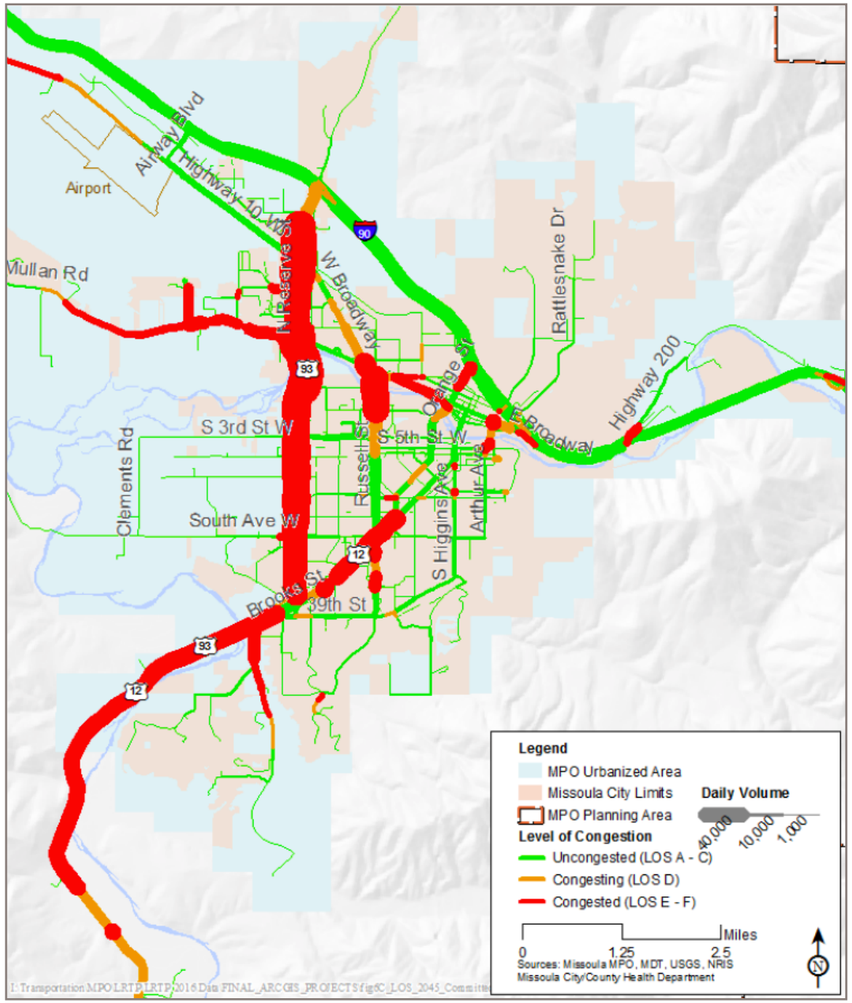


Figure 60: This map, from the *Long Range Transportation Plan*, shows roads on which the difference between drive time during peak congested periods and empty periods is the greatest, forecasted for the year 2045. It does not show streets on which travel (by car or by bus) will be consistently slow all day, though these streets should be a concern for transit priority as well.

Figure 61: Bus Lanes and Transit Signal Priority can prevent declines in speed and reliability as Missoula grows. (Illustration from NACTO Transit Street Design Guide.)

6 Planning and Policy

Primary Transit Network

The Primary Transit Network (PTN) is meant to inform the discussions and decisions about anything that should be located near useful, all-day transit. Health facilities, major employers, schools, affordable housing, social services and others should choose locations that aren't simply near a transit line, but *near a transit line that is likely to be permanent*. This means that land use planners also need to know where transit is likely to be permanent, so that they can create regulatory and economic conditions that draw such entities to these areas. The PTN can be described as *the transit network on which to build the city.*

> The Primary Transit Network can be described as *the transit network on which to build the city.*

The PTN has been drawn based on the Long-Term Plan Network and includes of all the corridors that are likely to have frequent, all-day service in 2043. The PTN reflects decisions made in land use and transportation plans, and is meant to be a response to those plans that helps people understand where the most useful transit is likely to be in the future.

The Primary Transit Network closely reflects the 2043 Long-Term Plan Network and includes all corridors planned for 15-minute or better frequency. Routes planned for lower frequencies are included in this map in the background, but are not part of the Primary Transit Network.

Reserve Street is included as a candidate PTN corridor, but its candidacy is deeply contingent upon both future growth and radical change to the design and operation of the road. While it is currently flanked by agricultural plots, detached homes, and some small-scale commercial establishments, it is designated for increased density and a mix of uses in the *Our Missoula Growth Plan.*

Figure 63: Reserve Street is designated for "Community Mixed-Use"

Reserve Street could ultimately be included in the Primary Transit Network because:

- **The area is designated for Mixed-Use**
  If this development actually occurs, the corridor will likely generate high transit demand.

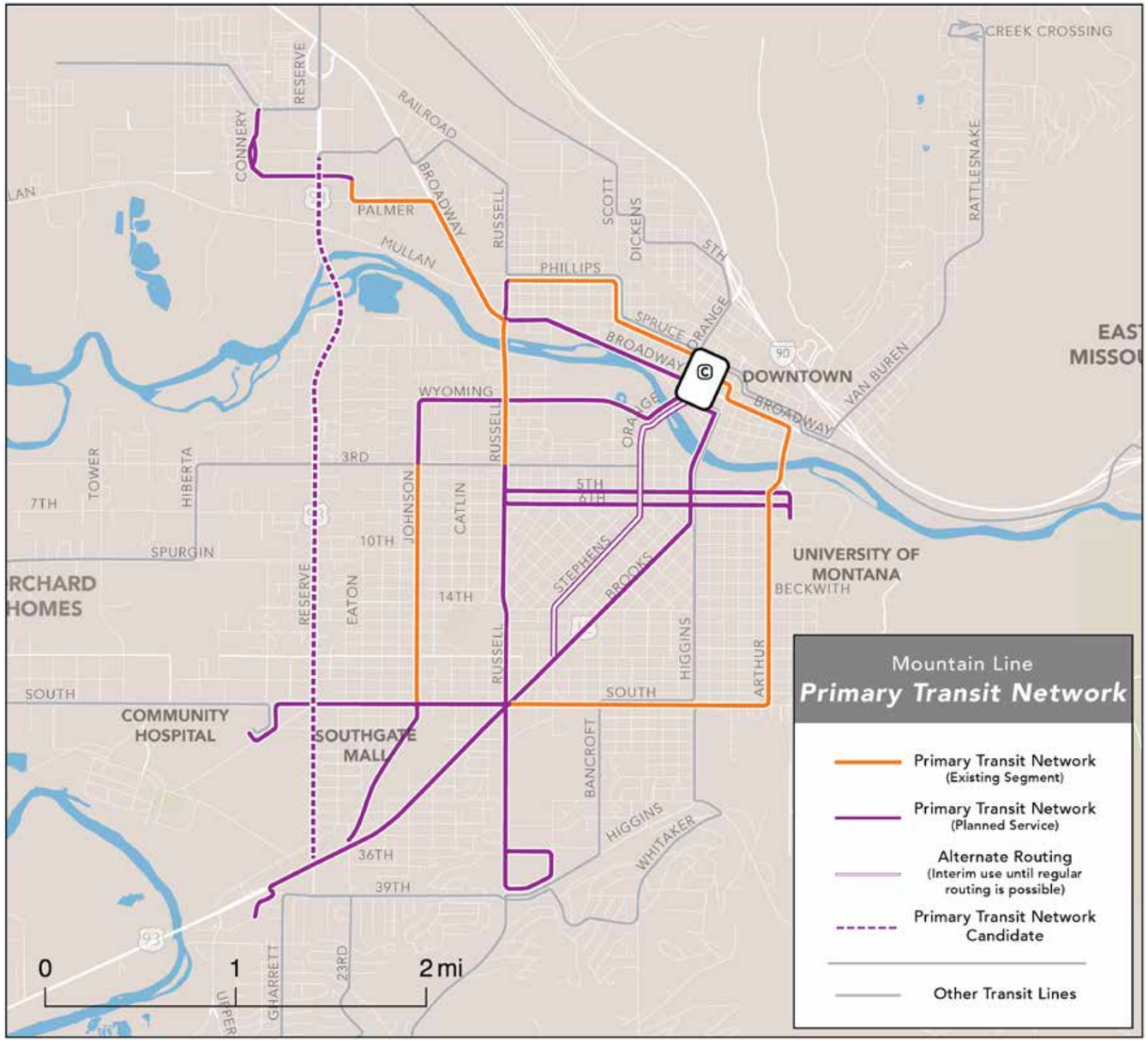


Figure 62: The Primary Transit Network is made up of corridors on with the most frequent and useful transit is likely to operate in 25 years. These corridors are based on the Long-Term Network, which is itself derived from the *Our Missoula City Growth Plan* and the transportation goals in the region's *Long Range Transportation Plan.* The designation of corridors relates not only to growth and demand but also to the geographic and geometric constraints that govern where transit can be cost-effective.

- **The planned development is continuous and linear**
  All of South Reserve Street, from 3rd Street to Brooks Street, is planned for continuous density along a straight corridor. This is a geometric pattern that transit can serve very well.

- **The wide street offers the potential for transit lanes in the future**

However, Reserve Street faces some major hurdles to reaching its full potential as a transit-intensive corridor:

- **Existing density along the corridor is very low**

- **Reserve Street is not pedestrian-friendly**
  Reserve Street has high traffic volumes, a five-lane cross section, and a 45 mph speed limit. There are few intersections with pedestrian crossings, and those that exist have long light cycles and long crossing distances.

- **Reserve Street is under State jurisdiction and is managed to prioritize vehicle throughput**
  The Montana Department of Transportation may not be willing to convert Reserve Street from a nearly-limited access highway into a walkable, urban street that transit can serve well.

While there are significant challenges to making major changes to the corridor at this time, it is conceivable that state, MPO and local priorities may align in the coming years such that Reserve Street may be re-imagined as less of a highway and more of a boulevard. If such a transformation is realized in the future, and if dense development along the corridor occurs, Reserve Street can become a part of the PTN.

Action item: Determine which upcoming land use or development plan updates should take into account transit usefulness and permanence. Work with staff at the City of Missoula to reference the PTN or named PTN corridors in updated plans, where appropriate.

Action item: Update Mountain Line system maps to make frequency and span visually obvious to the general public.

Development-Linked Funding of Service and Infrastructure

Cities and counties are already well aware of the ways that physical improvements can be funded as part of development projects. Signals, sidewalks, trails, sewers or roadways are sometimes required when a private party wants to develop land adjacent to a road that is below standards.

Funding capital improvements is relatively easy

Developers are sometimes required to make investments in transit infrastructure at the same time. The simplest case is that of the bus pad and stop: a developer builds out a wider sidewalk and a sheltered bus stop as part of a "half-street" improvement. This is a wonderful contribution, but it can sometimes happen in the wrong place – on a route that is soon to be cut, or at a bus stop that is too close to adjacent bus stops and should be eliminated anyway.

Mountain Line will advocate for transportation infrastructure improvements to be funded as part of development projects on the Primary Transit Network. The PTN is made up of corridors that are most likely to have high ridership and useful service over the long run, and so where it is appropriate to ask private parties to invest in long-term infrastructure.

Funding service operation is more challenging

Raising funds for capital improvements through new development is relatively straightforward. Raising funds to operate service is difficult, and dangerous. If a new development makes a one-time contribution towards transit operations, and receives a service in return, the transit agency is now accountable to riders and neighbors for that service in perpetuity. If the route generates little ridership or is expensive to operate, the agency may be faced with cutting it in the future, to the great disappointment of the new residents.

Two mechanisms are available for newly-developed areas to fund ongoing operations in a sustainable way:

- A residential or commercial area can form a non-profit Transportation Management Association, which also can collect dues to fund programs and services.

- If a large residential or commercial development has reason to charge on-going parking fees, that revenue source could be used in part to support nearby transit service.

Action item: Meet with City and County development-review staff to clarify where transit infrastructure investments should be required of new developments.

Guidelines for Measuring Ridership Performance

This section includes general guidance for how Mountain Line routes can be monitored in the future, in particular with regards to ridership relative to cost. This section refers to a few measures for which Mountain Line may decide to set numerical standards in the future, such as:

- Productivity (riders per hour of service)

- Subsidy per passenger (operating cost per passenger less fares)

- Density required for new coverage (residents or jobs per square mile, within ½ mile of a potential new route)

General guidance for using transit ridership data

- Whenever possible, use one full year's worth of data to calculate any measure related to ridership and operating cost.

- Collect transfer and linked-trips data to better understand how ridership responds to network design changes. This eliminates any suspicion or confusion about whether ridership is *really* growing as opposed to boardings growing because of a network change that requires a new transfer. Linked-trips data also helps measure the impact of routes being combined, or split. For example, combining a pair of routes (e.g. 1 and 2, or 15 and 7) , may improve travel time for people but actually reduce boardings by only counting them once. If boardings are the only measure of ridership, that might look like a failure. This can distort an agency's planning decisions.

  For operations, transfer data can also help reveal the most common connections that may benefit from refinements in scheduling.

- Be very cautious when evaluating the productivity of a route by time of day or week. High ridership at some times may depend on the availability of service at other times, even if few people use the service at those other times. People choose to rely on a route because of its complete scheduled offering, and value the "insurance" provided by service at times when they don't regularly travel. Cutting unproductive trips at certain times of day can cause

ridership drops at other times of day.

Action item: Collect transfer and linked-trips data to better understand how ridership responds to network design changes.

Productivity standards for fixed routes

There is no objective standard for the productivity of a fixed route. Fixed routes are mostly evaluated relative to one another, and relative to what the transit agency believes is possible in their particular city.

Mountain Line's overall productivities have increased a great deal since *Bolt!* frequency and span were improved and Zero-Fare was implemented in 2015. Yet there remains a great deal of variability in the productivity of each route in the network as shown below in Figure 64.

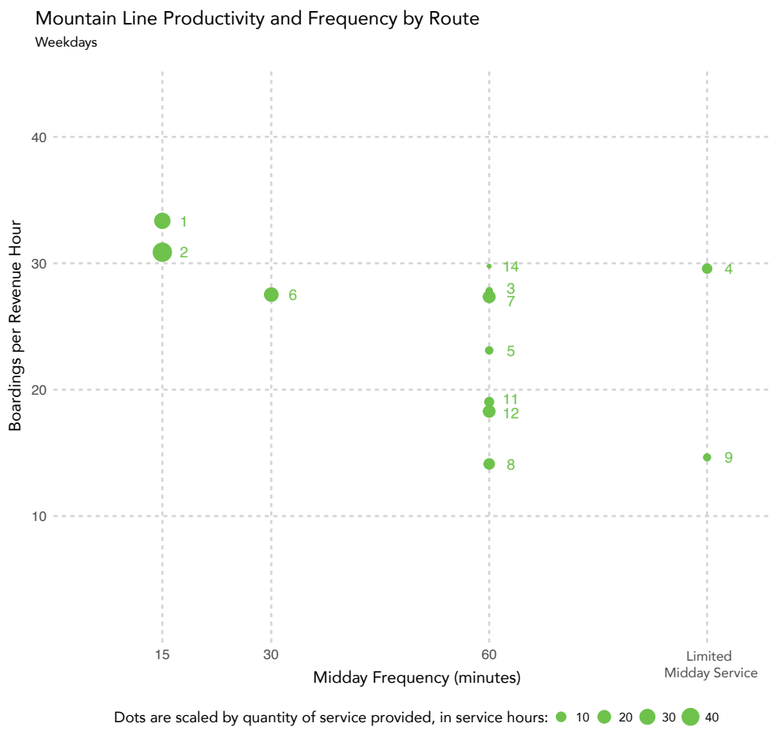


Figure 64: A scatterplot is a helpful tool for visualizing route-by-route productivity.

Any agency that wishes to increase ridership within its fixed budget is continually reevaluating its least-productive routes. Every service hour invested in the least-productive routes is attracting fewer rides than it would if it were re-allocated to improve a more-productive route.

A scatterplot is a useful tool for comparing productivities among routes, and observing relationships between productivity and frequency; or productivity and total annual service hours. Mountain Line can continue to update this scatterplot with productivity and frequency data each year, to monitor route-by-route productivities and inform service changes.

Subsidy standards for flexible, demand response services

Demand response service (such as dial-a-ride or the app-enabled dial-a-ride that is called "microtransit") can be evaluated using subsidy per ride rather than productivity.

Productivities for demand response service are rarely higher than 5 boardings per hour, typically much lower than the lowest-tolerable productivity on fixed routes. Mountain Line may wish to operate demand-response services that get lower ridership than fixed-route services, as long as the operating costs are lower and/or the fares paid by passengers cover more of the cost.

If Mountain Line chooses to pursue demand-responsive service in the future, it can set a floating ridership-related standard for demand-response services, in which their operating subsidy per ride can be no bigger than the average subsidy per ride for the three least-productive fixed routes. This ensures that demand response riders are treated fairly with respect to fixed-route riders.

It is valuable, in calculating the operating subsidy per ride, to account for the extra vehicle costs associated with specialized services. For example, if a shuttle is in operation for only 4 hours of the day, its operating cost could be described as 4 daily service hours. Yet to provide that shuttle, the agency is purchasing, maintaining and storing a unique vehicle that only gets used at peak times, for 4 hours a day. In contrast, a vehicle on a fixed route is likely in use for 16 hours a day. Service hours alone will not capture the total operating costs of these routes. It will be important to account for the higher costs of the shuttle, in calculating subsidy per passenger, as well as the higher or lower fares paid by passengers on the shuttle.

Action item: Adopt a subsidy standard for any new demand-response service that relates to the subsidy provided on low-ridership fixed routes.

Remedial actions for low-productivity fixed routes

If a route or segment that staff believes is failing to meet its minimum standard for productivity, the following questions should be asked and possibilities explored:

- Does the failing route or segment also fall far below the system average on measures of speed or reliability? If so, those factors may be inhibiting its productivity.
  - Work with operations to determine whether factors within the agency's control can be changed to improve speed or reliability.
  - Work with local traffic officials to improve speed or reliability using different signal or street treatments.
- Is there a reason to expect the route's performance to improve soon, such as imminent dense development along the route? If so, the route can be maintained on a "watch list" to see if development and the built environment raise its productivity.
- Can the failing route be taken apart into fewer detachable segments (each of which could be operated as a standalone route, or added to a different route)?
  - If so, then detach it into multiple standalone routes, and estimate the productivities of the detachable segments.
  - If different segments of the route have very different productivities, that implies that service levels are not well-matched to demand over a large part of the route. It may be appropriate to consider ways to re-combine these segments with one another or with other route segments in the network, so that service levels are well matched to demand in the future.
- If frequency or span were reduced during lower-demand periods (such as on evenings, weekend mornings or Sundays) would that improve the productivity?
  - If so, consider doing so.
  - Whenever possible avoid *eliminating all service* at a certain time of day, including eliminating the last trip of the day, and avoid eliminating midday service. Preserve the span of service for as long as possible, while reducing evening and weekend frequencies as a first resort.
- If, over time, a fixed route or segment continues to fail to meet a productivity standard, it should either be redefined as a Coverage route (having no productivity standard) or be ended.

Remedial actions for high-subsidy coverage flexible services

If a Coverage Flexible service is not meeting its subsidy per ride standard, that means that the agency is subsidizing each rider by a greater amount than on its fixed route services, even though the flexible rider is receiving a more premium service (door-to-door). The following questions should be considered and possibilities explored:

- Does the failing service have operational problems that are preventing it from delivering a satisfactory experience to riders?
    - Examine the service's on-time performance, trip length and customer interactions and work with Operations to determine if these can be improved without additional operating resources.
- Is there a reason to expect the service's performance to improve soon, such as dense development in the service area or the launch of a new app for scheduling rides? If so, the service can be maintained on a "watch list" to see if development and the built environment reduce the subsidy per ride.
- Does the service have substantial peaking that requires multiple drivers and vehicles to be available "on the clock"?
    - If so, consider strategies to flatten out that demand, so that fewer drivers and vehicles need be "on the clock" throughout the service span.
    - Requiring reservations the day before a ride allows for more efficient use of drivers and vehicles, though worsens the rider experience.
    - Raising the fare during peak times, or simply nudging riders to travel at a different time, can help shift rides to non-peak times.
- Is the span of service above the minimum for fixed route services? If so, consider reducing it to the minimum.
- Consider increasing fares for Coverage Flexible services only, which will decrease the necessary subsidy per ride. If this has the side-effect of nudging some riders to use fixed-route services instead, that is a benefit.

Density guidelines for new coverage

Density guidelines may be useful for new coverage service, but since density is only one of a few factors behind the productivity of a route, density guidelines must be used in combination with some measure of walkability and linearity. These density guidelines can help Mountain Line respond consistently to requests for service in advance of planned development.

This density guidelines could be designed based on the number of people per 15 minutes of cycle time (driving + recovery) on a route who are within a 1/2 mile walk of a bus stop, on a moderately low ridership route today (e.g. the 11). This density guideline can then be set as a minimum for future coverage, with the condition that poor linearity or long distances might overrule the measure.

While this standard used for determining the viability of new coverage services, it may also be applied throughout the existing network in the future. Density guidelines do not apply to ridership-focused routes since it is sometimes useful to invest in frequency to connect end-points, and to make a better network, not just because of adjacent land use patterns.

Action Item: Create combined density and walkabilty guidelines to be used as a minimum standard for new coverage service.

Tax District Annexation

Since its formation in 1977, the Missoula Urban Transportation District has gradually expanded its boundaries in tandem with regional growth. Starting in the mid-1990's, the District has worked closely with the City of Missoula and Missoula County to ensure that all parcels subdivided for development are annexed and pay taxes to support Mountain Line services.

However, this process has led to a fragmented tax district. For example, there are many places in the City of Missoula that are not in the Missoula Urban Transportation District. This has led to confusion among residents, and difficult choices for the District, which has an imperative to be fiscally responsible and make the most productive use of constrained public funds.

Action item: Work with the City to ensure that all annexations within the City are added to the Taxing District. Evaluate gaps in the District, especially where there is dense development that is proximate to the existing transit network, and explore ways to fix them.

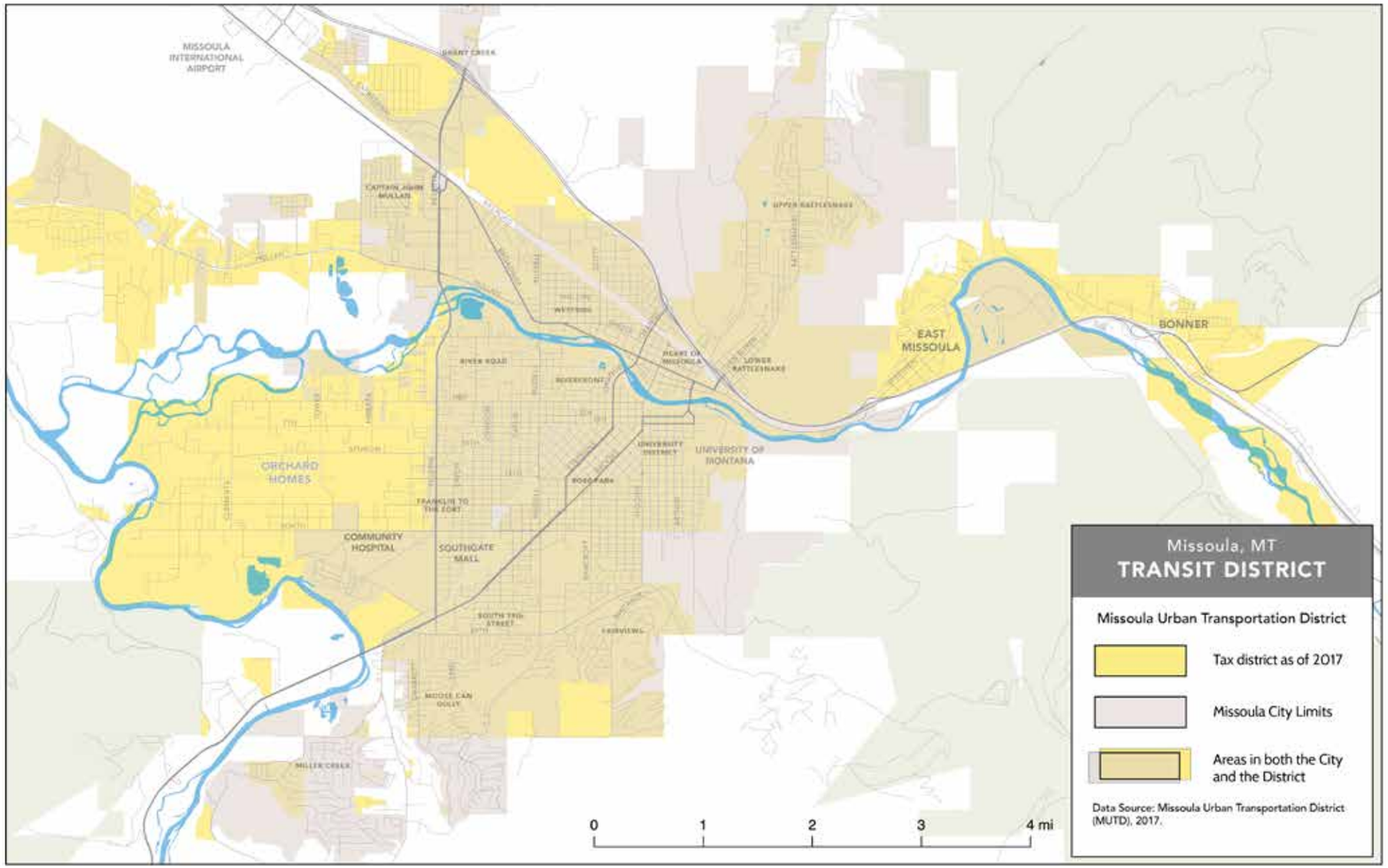


Figure 65: The MUTD tax district boundaries.

Action Item Summary

Action Items:

1. Update Mountain Line system maps to make frequency and span visually obvious to the general public.
2. Meet with City and County development-review staff to clarify where transit infrastructure investments should be required of new developments.
3. Adopt a subsidy standard for any new demand-response service that relates to the subsidy provided on low-ridership fixed routes.
4. Collect transfer and linked-trips data to better understand how ridership responds to network design changes.
5. Create combined density and walkabilty guidelines to be used as a minimum standard for new coverage service.
6. Work with the City to ensure that all annexations within the City are added to the Taxing District. Evaluate gaps in the District, especially where there is dense development that is proximate to the existing transit network, and explore ways to fix them.

Appendices

Appendix A: *Transit Choices Report*

The *Transit Choices Report* is available online, at mountainline.com/2018tcr

Missoula Urban Transportation District (Mountain Line) 2018 Strategic Plan

Appendix A: Transit Choices Report

APRIL 2017

JARRETT WALKER + ASSOCIATES

DJ&A, P.C.

Appendix B: Long-Term Network Access Analysis

Long-Term Network

The Mountain Line 2018 Strategic Plan Long-Term Network provides about 2.5 times as much service as the existing Mountain Line network. The Long-Term features a frequent grid (shown in red in the maps at right), which allows people to go from anywhere to anywhere on the grid, with a single fast transfer.

The long-term network also features higher frequency and faster, more direct routing. This allows passengers to reach more of the city in any given amount of time. Details on the design of the Long-Term network are available in the ***Missoula Urban Transportation District (Mountain Line) 2018 Strategic Plan.***

For the purposes of the isochrone analysis in the following pages, we made the following scheduling assumptions:

1. The existing routes 1 and 2 are interlined in a continuous loop in the existing network such that passengers can ride through both Southgate Mall and Downtown Transfer Center.

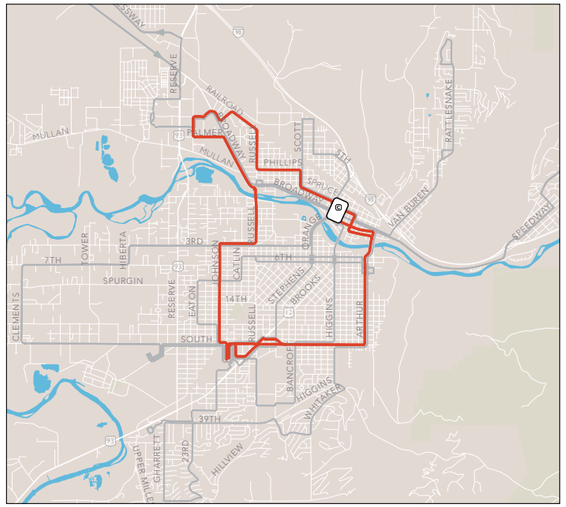
2. Route 15 and Route 1A are interlined in the Long-Term Network such that passengers can travel between North Reserve, the University, and destinations along South Avenue on the same vehicle.

Mountain Line

Existing Network

Frequent Route (15-minutes or better)

Other Transit Routes

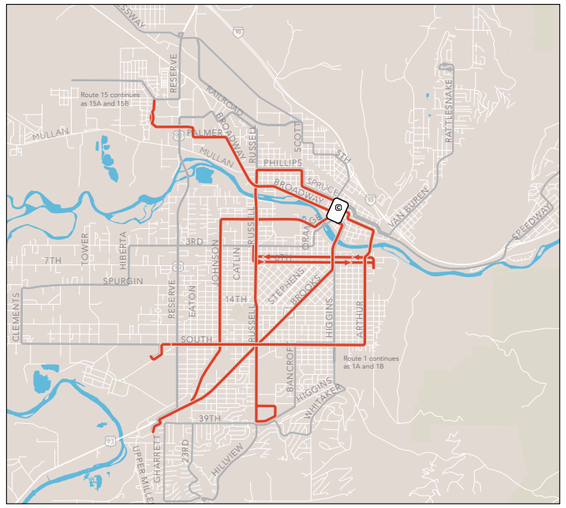


Mountain Line

Long-Term Network

Frequent Route (15-minutes or better)

Other Transit Routes



Access Analysis

Public transit ridership arises from service that is useful to as many people as possible, for as many trips as possible. A helpful way to illustrate the usefulness of public transport is to visualize where a person could get to using public transit and walking from a given location. The diagram at right illustrates this approximate area, and is called an isochrone. From the selected point, the isochrone shows where someone could be, on public transit combined with walking, in 30 minutes.

A more useful service is one in which these isochrone areas are larger, especially when the areas are situated in areas with a high density of residents or jobs. Even beyond usefulness, these diagrams show the level of personal freedom and opportunity afforded by the public transport network.

In this analysis, travel time includes the initial walk to the nearest stop, initial wait time, in-vehicle travel time, transfer walk, transfer wait, and walking at the end of the stop. The Long-Term Network isochrone from each starting location is overlaid on the Existing Network isochrone to illustrate the impacts of the expanded services.

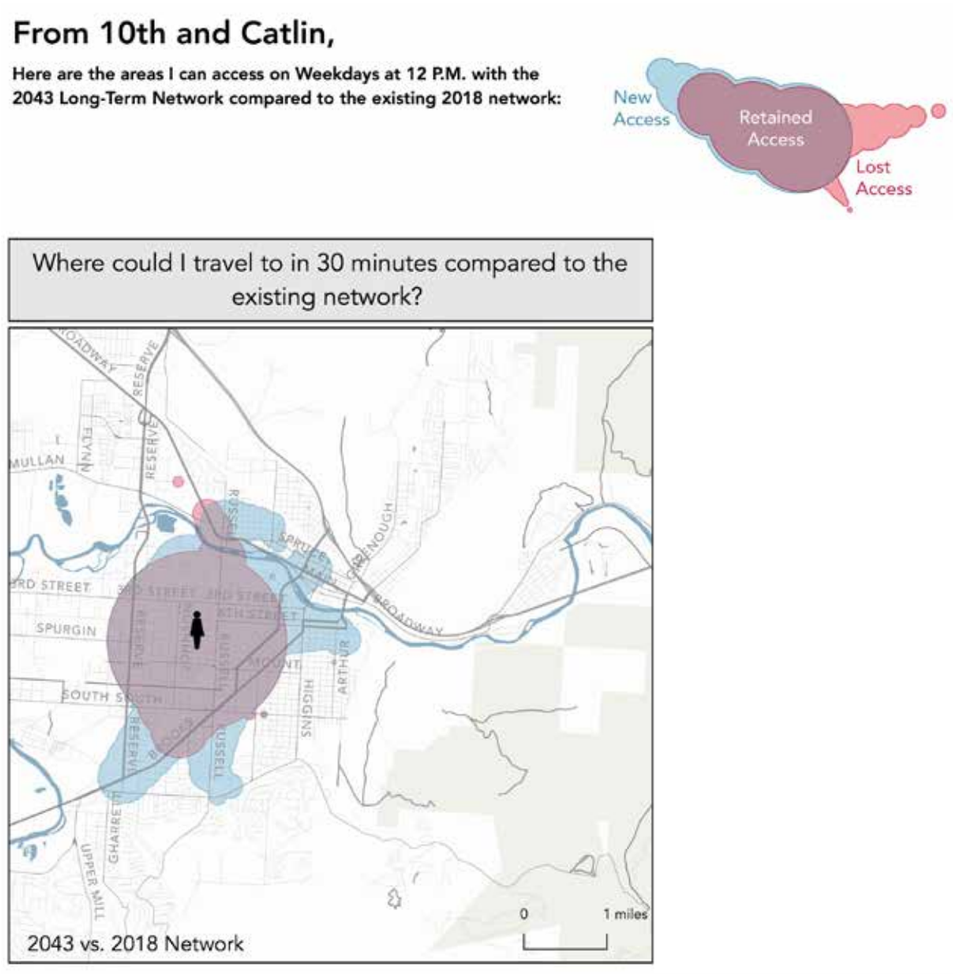
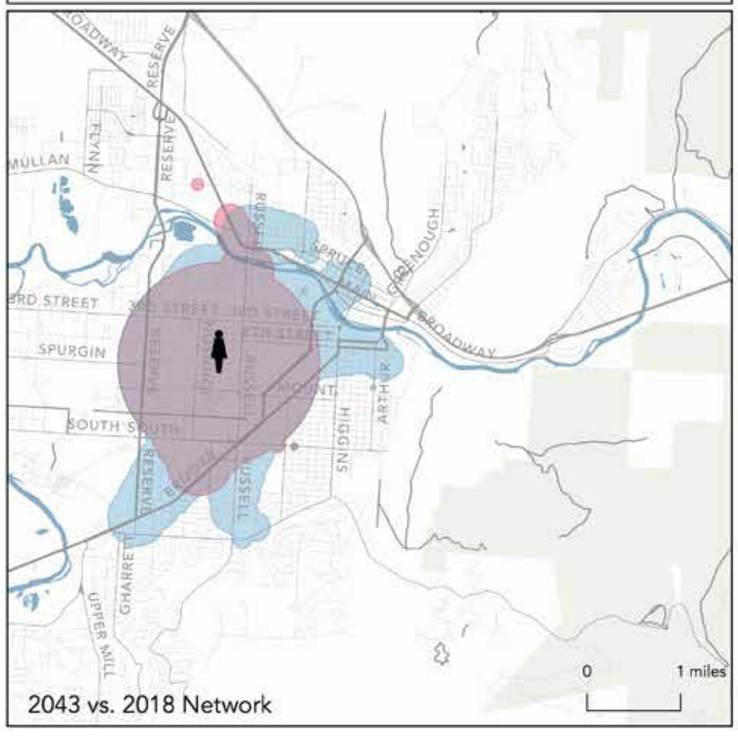


Figure 1: Example of 30-minute Isochrone Map

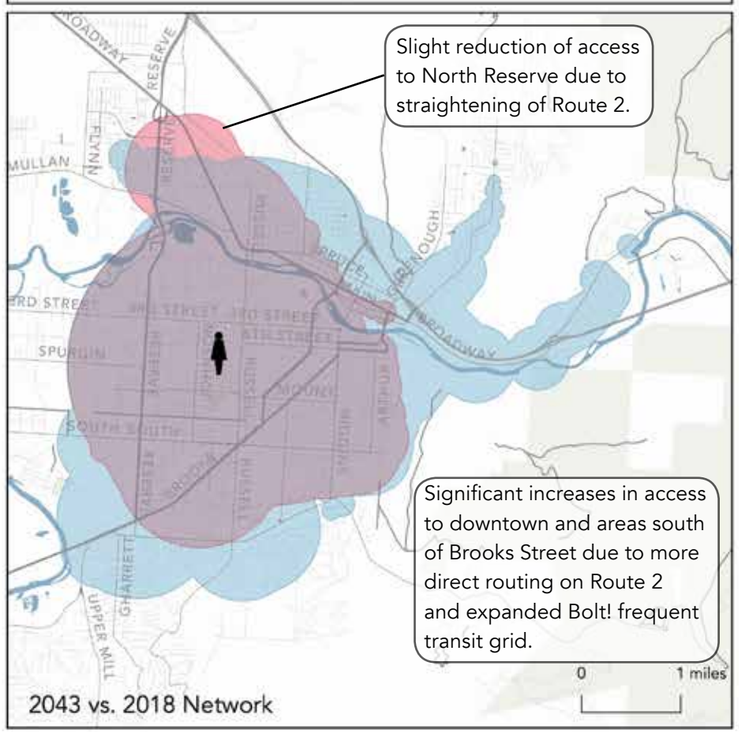
From 10th and Catlin,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



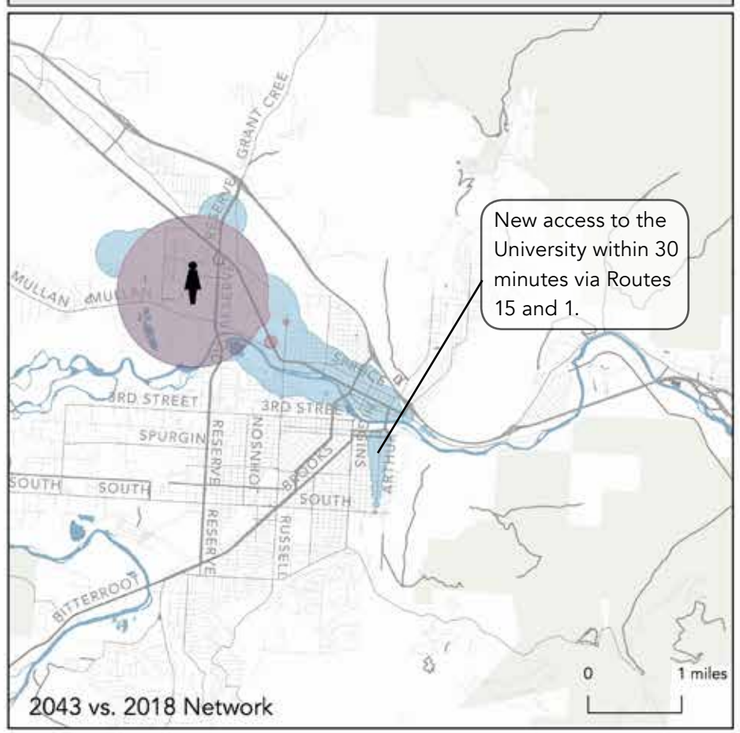
Where could I travel to in 45 minutes compared to the existing network?



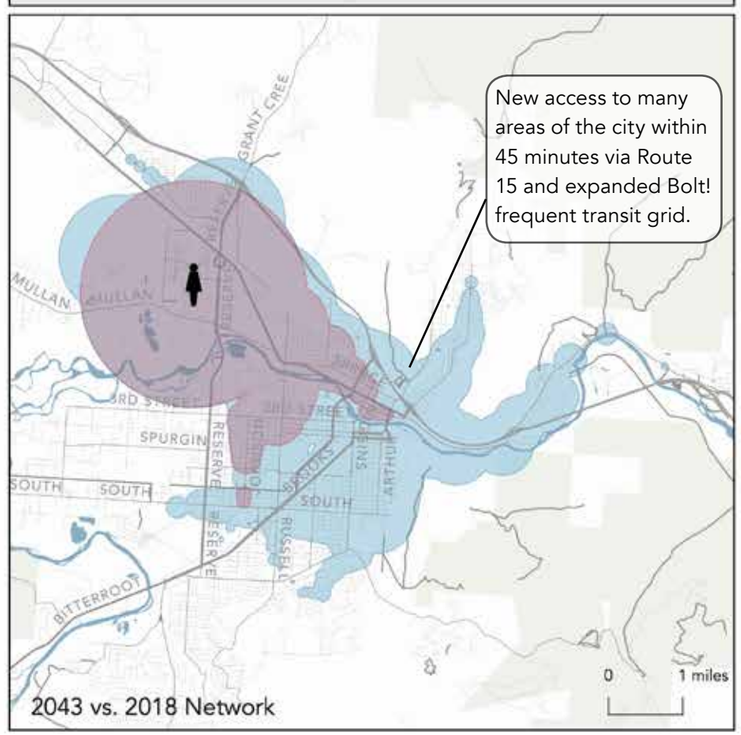
From American and Connery,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



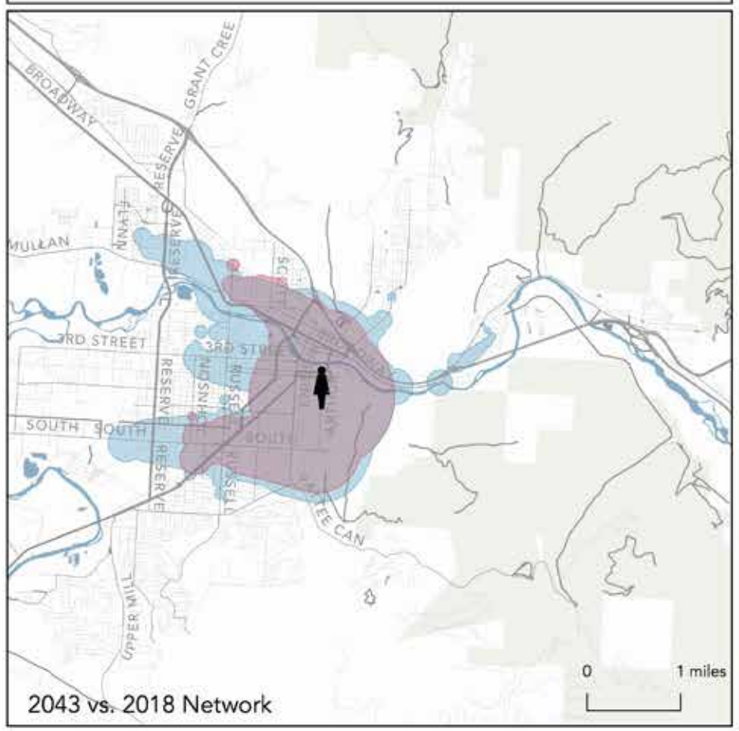
Where could I travel to in 45 minutes compared to the existing network?



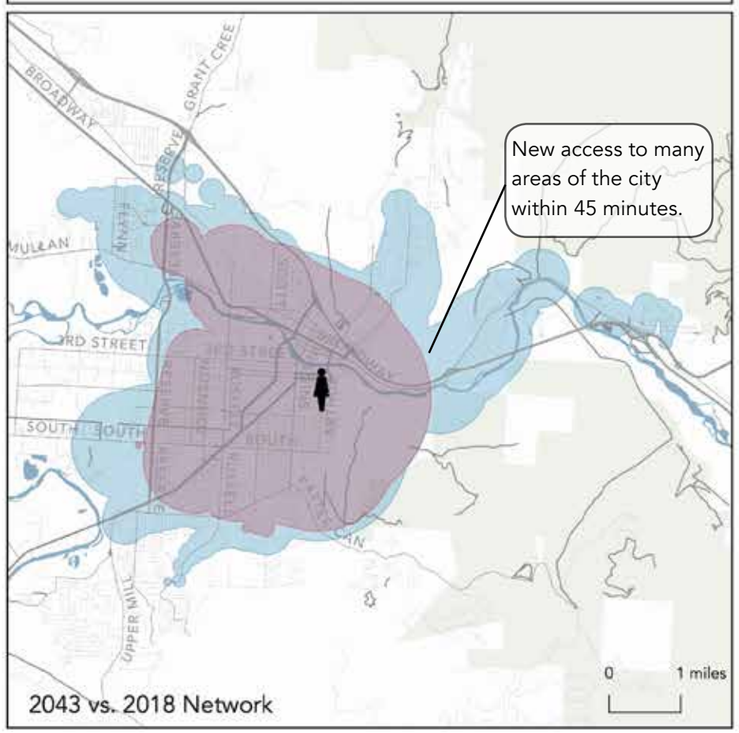
From Arthur and University,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



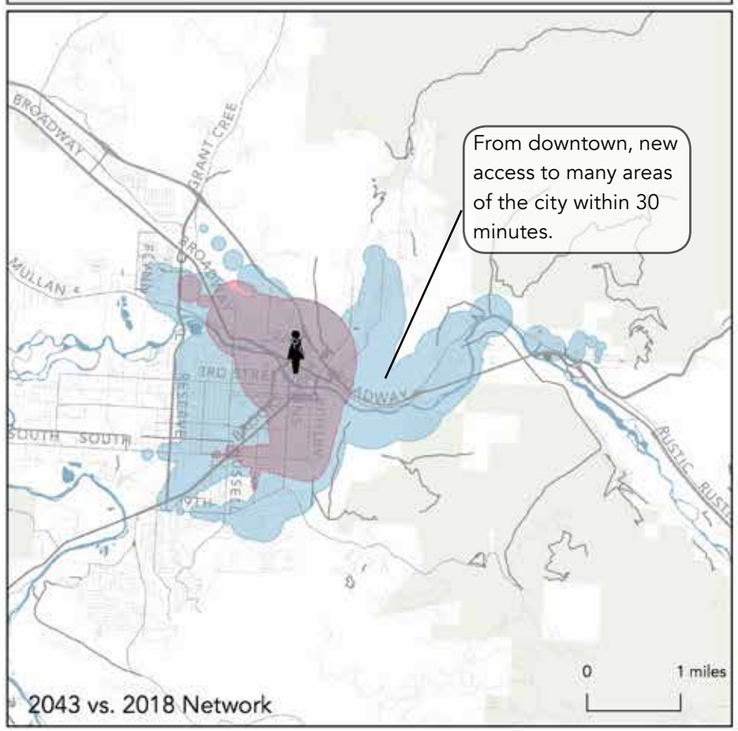
Where could I travel to in 45 minutes compared to the existing network?



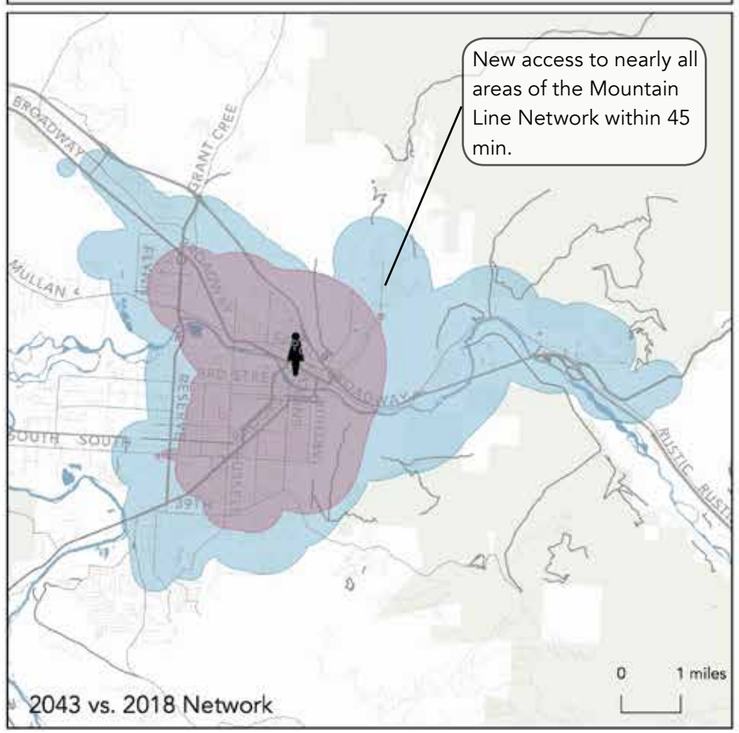
From Downtown,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



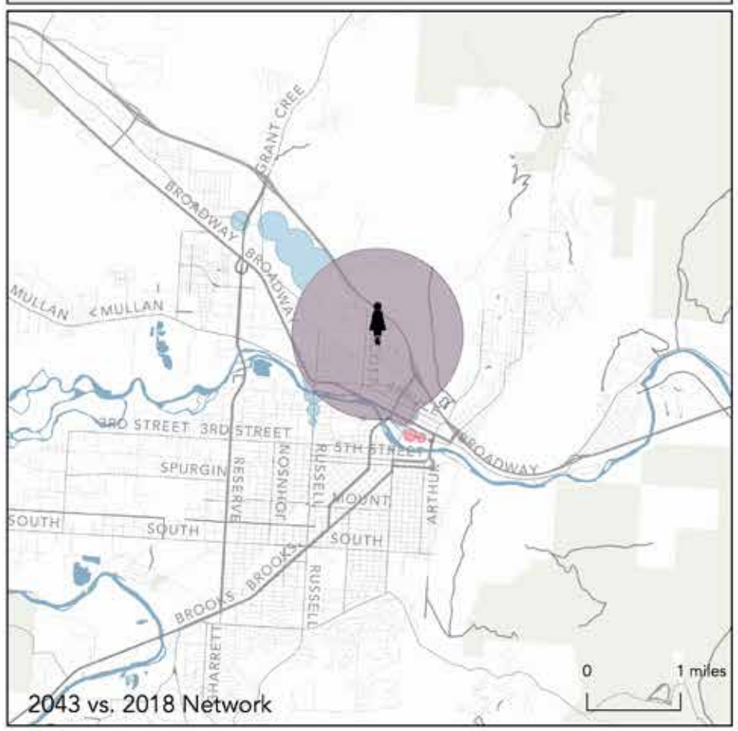
Where could I travel to in 45 minutes compared to the existing network?



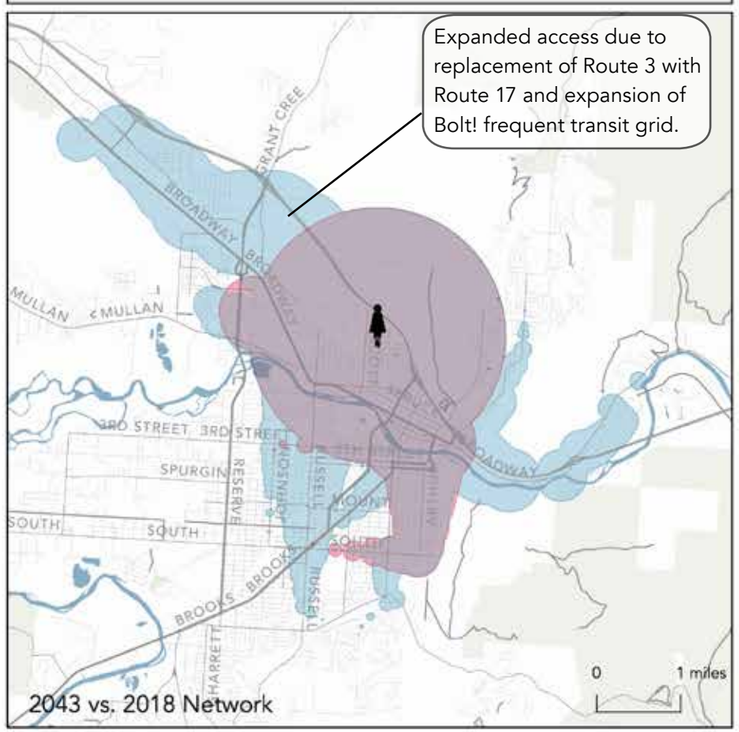
From Palmer and Dickens,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



Where could I travel to in 45 minutes compared to the existing network?

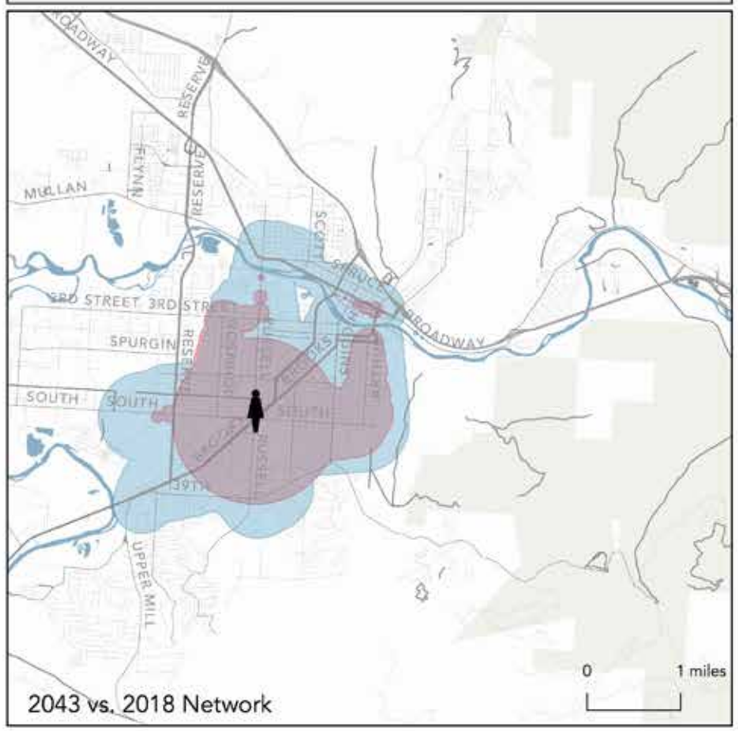


From South and Russell,

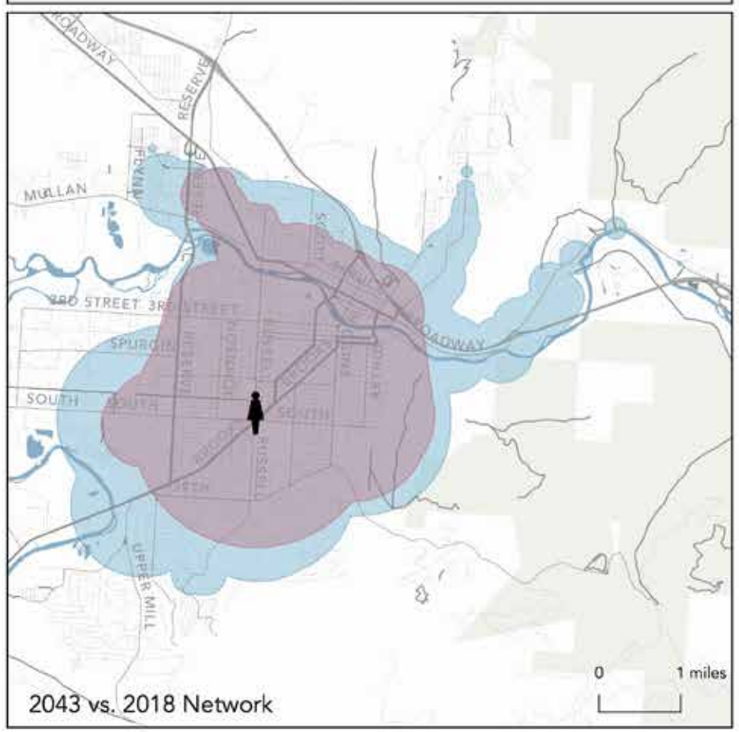
Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Note: For the purposes of this analysis, South and Russell is assumed to be location of the future South Transit Center.

Where could I travel to in 30 minutes compared to the existing network?



Where could I travel to in 45 minutes compared to the existing network?

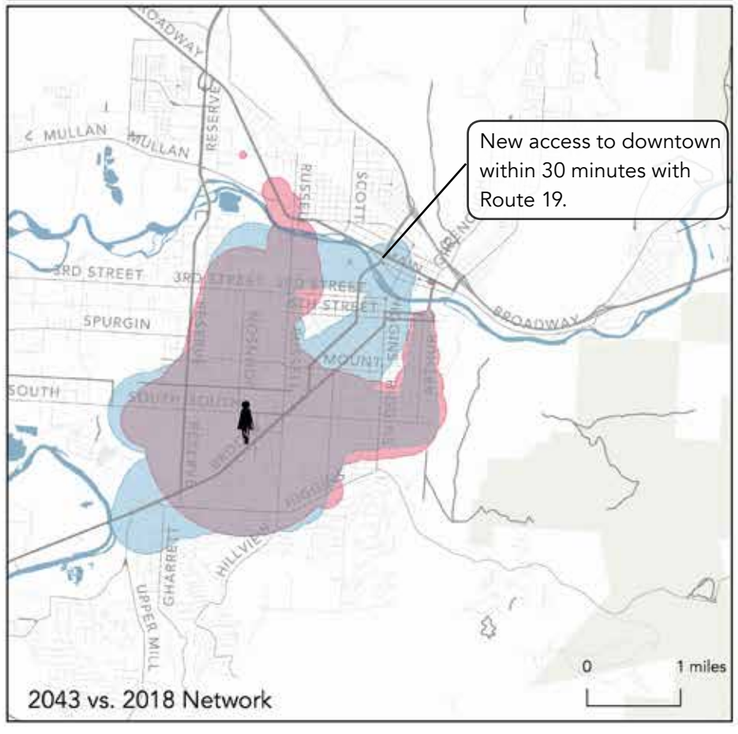


From Southgate Mall,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Note: This analysis assumes the future South Transit Center will be located at South and Russell. Access from Southgate Mall may be higher if the transit center is located closer.

Where could I travel to in 30 minutes compared to the existing network?



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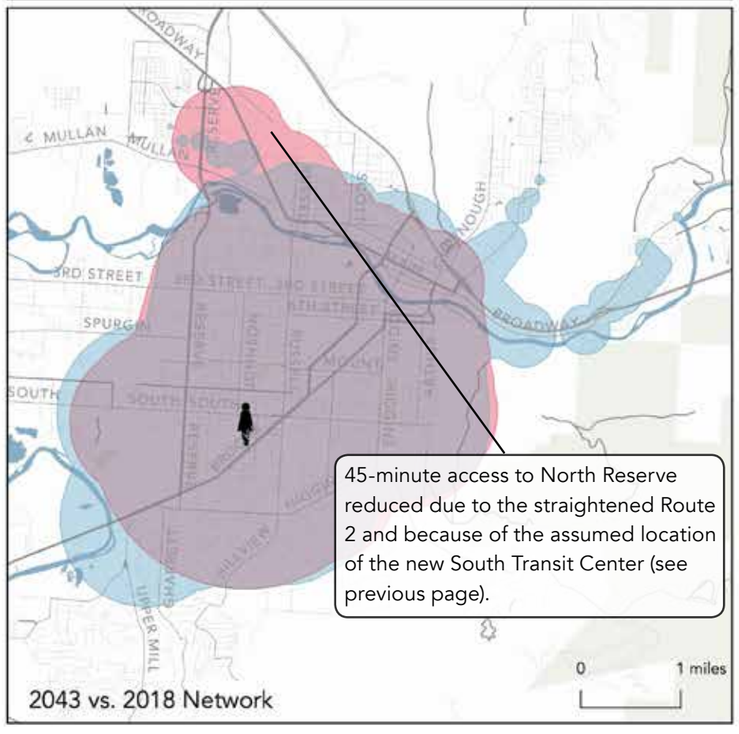
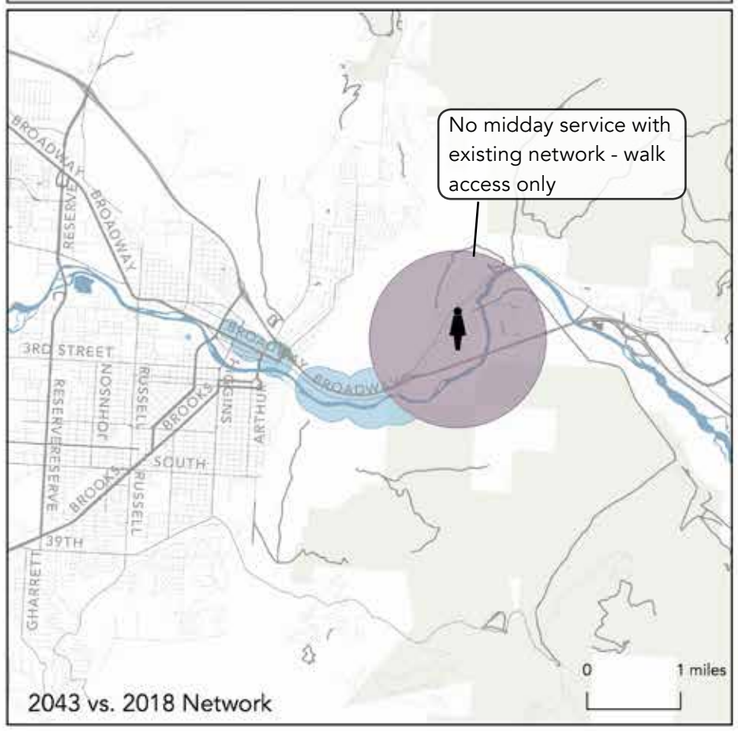


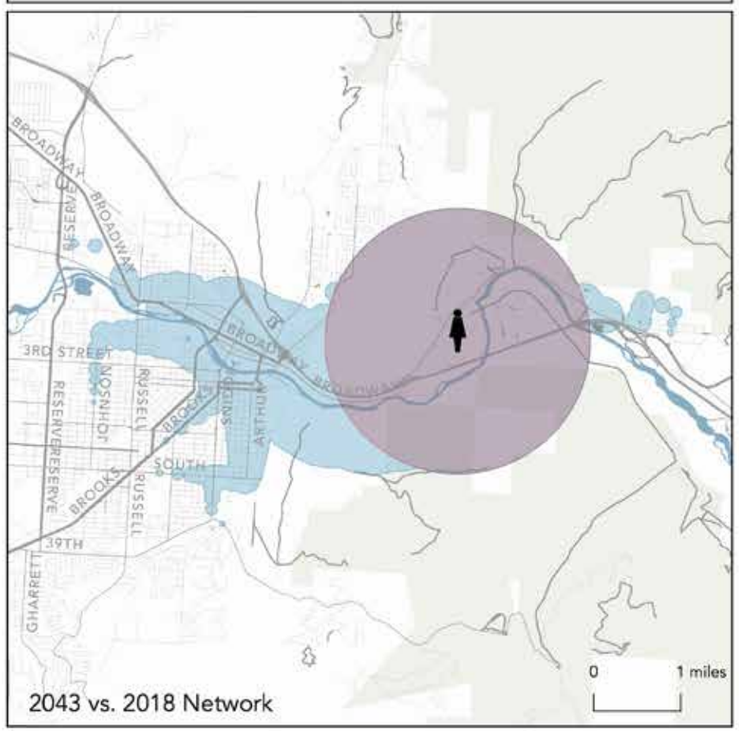
From Staple and Speedway,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



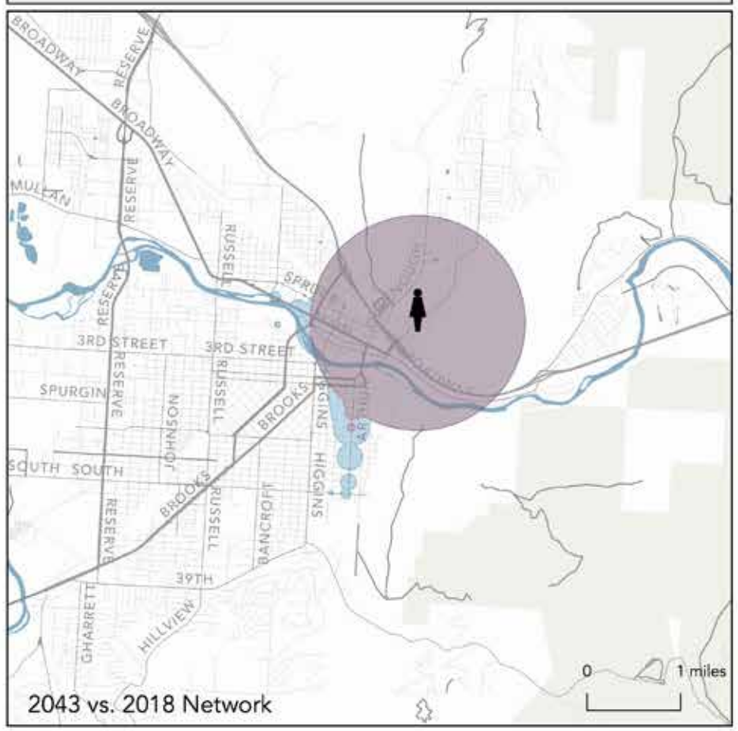
Where could I travel to in 45 minutes compared to the existing network?



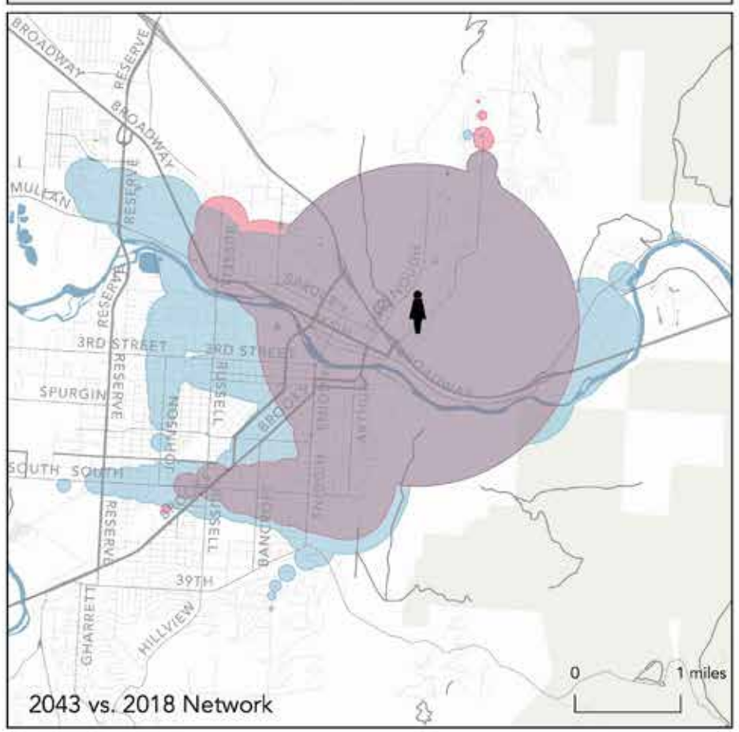
From Van Buren and Elm,

Here are the areas I can access on Weekdays at 12 P.M. with the 2043 Long-Term Network compared to the existing 2018 network:

Where could I travel to in 30 minutes compared to the existing network?



Where could I travel to in 45 minutes compared to the existing network?



Appendix C: Estimated Costs of Short-Term Network Phases

The table at right describes each phase of investment in the Short-Term Network in terms of:

- Increases in fixed route operating cost, based on the fully-loaded fixed-route operating cost per service hour in 2018.
- Increases in paratransit operating costs, based on the fully-loaded paratransit operating cost per service hour in 2018.
- Non-operator (driver) staff who will need to be hired, or retained for additional hours, in order to make the described service increases. This staff cost is already included in the fully-loaded operating costs.
- Estimated incremental operating costs of each phase.
- Other prerequisite costs that become necessary in order to add frequent service: additional vehicles and additional maintenance and storage space for those vehicles.

These costs are based on fully-loaded operating costs for the average service hour delivered by Mountain Line in 2018. A number of factors could change the actual costs of delivering this service in the future:

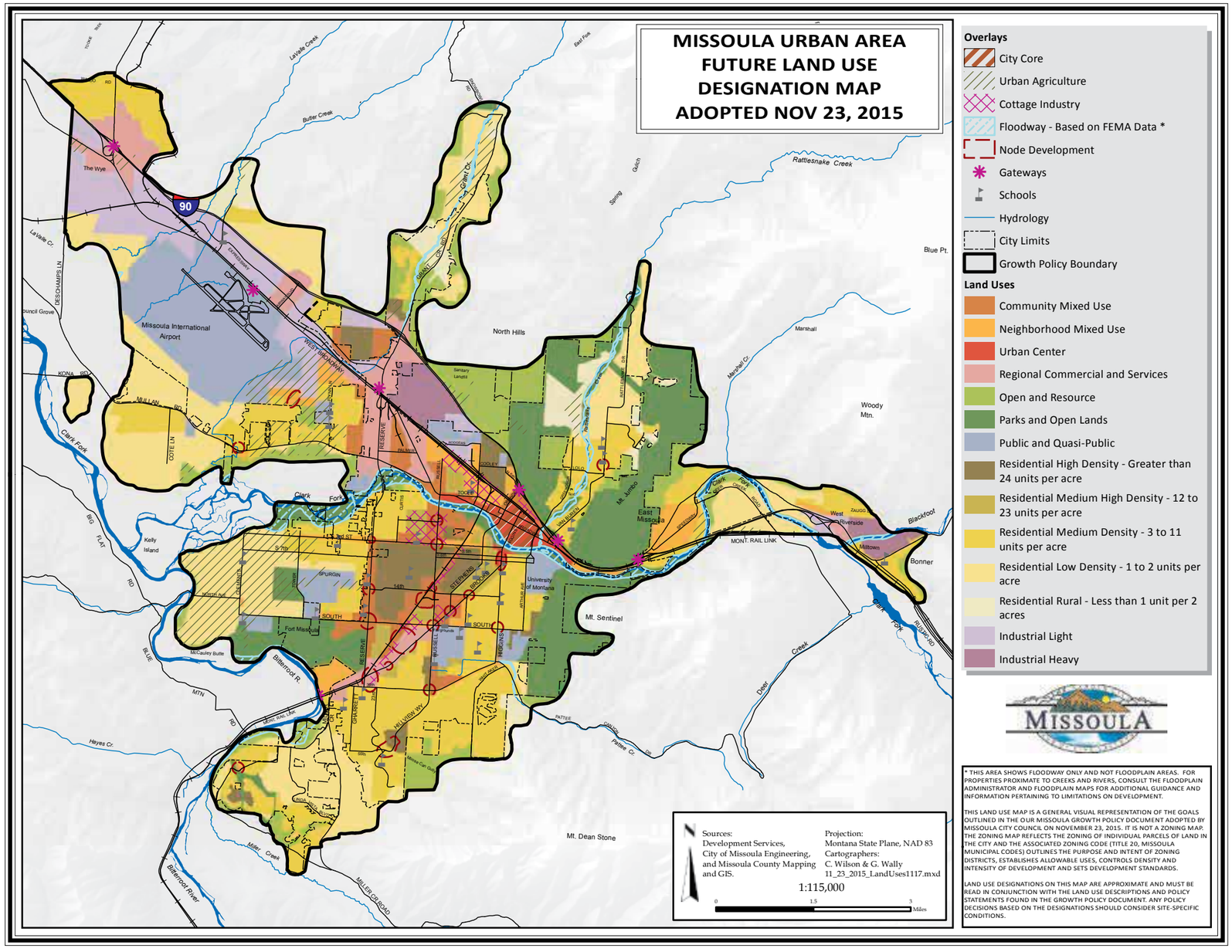
- Common sources of inflation in transit costs such as increases in health insurance premiums, pension and retirement premiums, fuel cost, or cost of living and wages.
- Major costs to acquiring or upgrading property in order to store and maintain a larger fleet of vehicles.
- Vehicle purchase and maintenance costs.
- Growth in paratransit demand that causes a greater number of para-transit operators, dispatchers and vehicles to be available during the fixed route network's span.

Short-Term Network Plan Phases		Incremental Cost Increases (Based on a fully-loaded operating cost of $132 per service hour.)				
Phase	**Description**	**Fixed Route Operating Cost**	**Paratransit Operating Cost**	**Additional Non-Operator Staff** (included in Operating Costs)	**Total Estimated Incremental Operating Costs**	**Other Prerequisite Costs**
Phase 0	Add one full-time supervisor.	$0	$0	One full-time supervisor is needed to support any growth in service.	$80,000	
Phase 1	Extend Route 4 span from peak-only to all-day on weekdays. Reduce Route 11 frequency from 60 minutes to 90 minutes to improve reliability, and add one additional daily round trip..	$200,000	$0	None	$200,000	
Phase 2	Lengthen span of service on Saturday by up to 6 hours. Add Sunday service on most routes.	$940,000	$70,000	Additional shifts for supervisor, mechanic, service worker, dispatcher and paratransit coordinator.	$1,020,000	
Phase 3	Extend weekday span of service by up to two hours, and increase early-evening frequency on Routes 1 and 2.	$710,000	$30,000	Additional time for supervisor, mechanic, service worker, dispatcher and paratransit coordinator.	$740,000	
Phase 4	Introduce 15-minute *Bolt!* service in the Captain John Mullan eighborhood with Route 15. Streamline Routes 2 and 11. Improve frequency of Route 11 and make service on Expressway two-way.	$1,060,000	$0	None	$1,060,000	Capital costs include the purchase of 3 additional vehicles, expanded maintenance and storage capacity. Move bus stops along Routes 2 and 11. Improve bus stops at the intersection of Russell & Phillips.
Phase 5	Increase frequency on Route 7 to *Bolt!* levels all-day on weekdays.	$970,000	$0	None	$970,000	Capital costs include the purchase and storage of 2 additional vehicles. (Storage and maintenance capacity were increased in Phase 4.)
Operating cost (over and above existing network) after Phase 5					$4,070,000	

Appendix D: *Our Missoula City Growth Policy*- Future Land Use Map

The map at right shows the future land use designations adopted as part of the *Our Missoula City Growth Policy* in 2015.

The underlying geographic data in this map was re-purposed for the maps shown on earlier pages of this Plan (such as on page 40), restyled so that land uses that tend to generate high transit ridership are more visible.

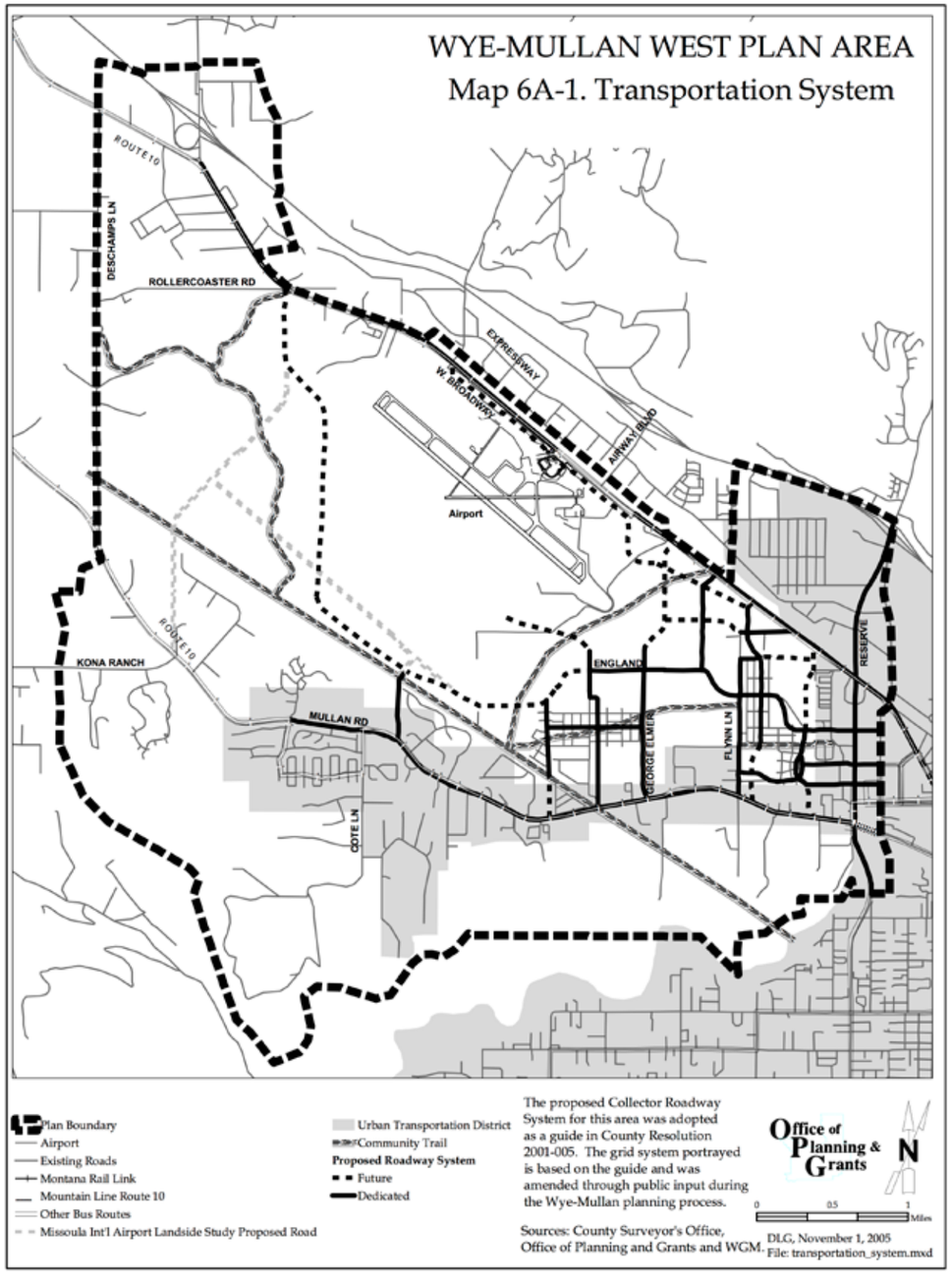


Appendix E: West Broadway / Mullan Road Area Street Network

The Long-Term Network includes new routes around North Reserve Street in the Captain John Mullan neighborhood.

This neighborhood is woefully poor in through-streets and linear development patterns, making it hard to serve with useful transit. However, some new street connections indicated in the *Wye-Mullan Comprehensive Area Plan* map (at right) make it possible to thread the labyrinth.

The Collector streets shown on this map (unlabeled) were adopted by the County in 2001. The *Comprehensive Plan* that includes this map was completed in 2005. It is not clear whether this street network is still expected to be built as designed.



Appendix F: N. Reserve / Scott Street Industrial Area Street Network

The Long-Term Network includes a new route through the industrial area between North Reserve, Scott Street, I-90 and the railroad.

The map at right is taken from the *North Reserve/Scott Street Master Plan*, approved by the Missoula Redevelopment Agency in 2016. Based on the land uses and street network shown in this map, the transit routing that seems most likely to attract high ridership and minimize costs is via the future Howard Raser Avenue.

A route via Cemetery Road is possible in the interim period, before this street network is built out. If the multi-modal overcrossings of the railroad are built as envisioned in this *Master Plan*, then a route via Cemetery Road might attract more ridership than a route via Raser Avenue, because of the potential riders who could reach the route from south of the railroad tracks.

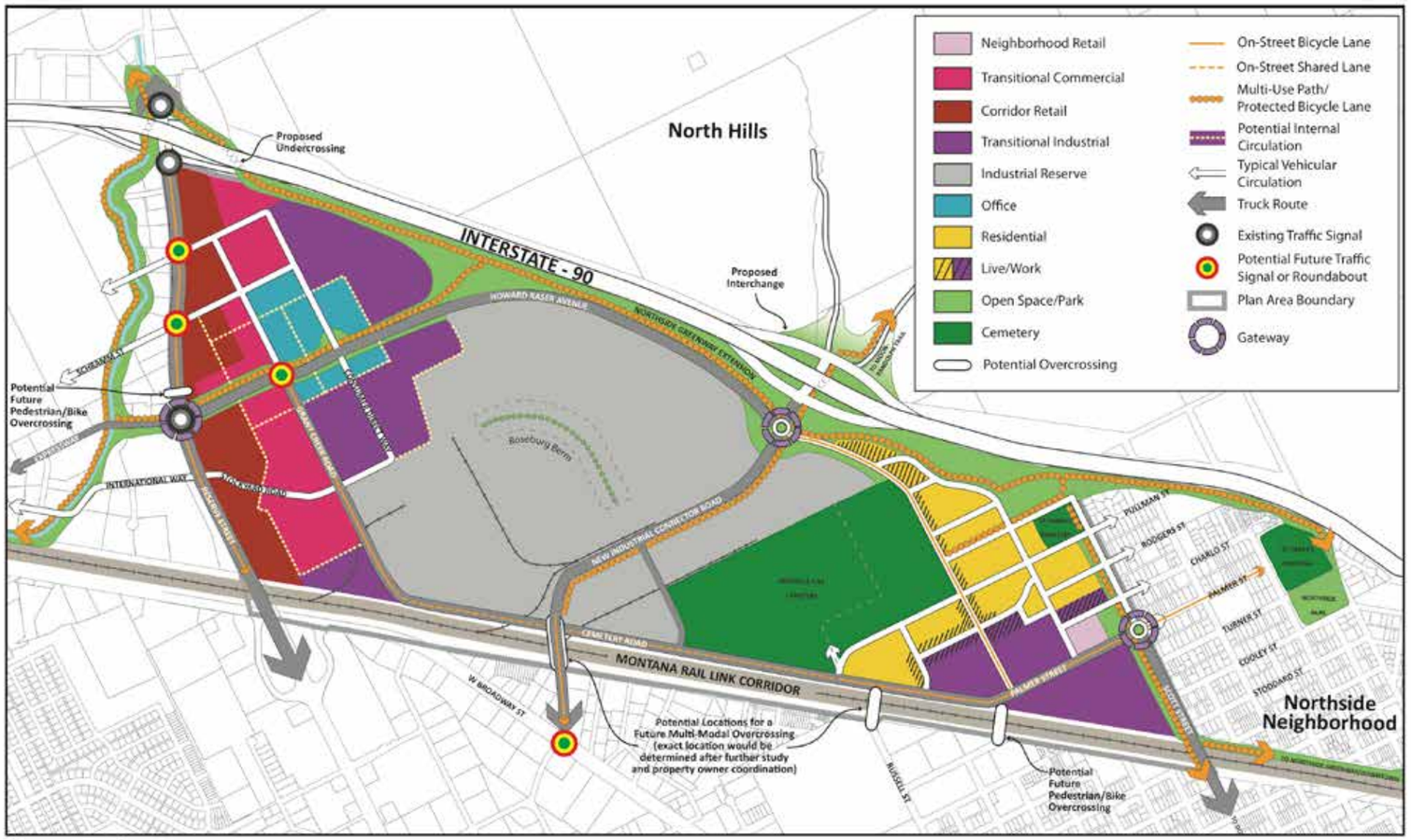


Figure 4-1: Plan Concept Map

Specific land uses are recommended to create synergy and appropriate buffers between different land uses.

Appendix G: Short-Term Network Routing, Frequencies & Hours of Service

This table details the Short-Term Network's Routing, Frequencies and Hours of Service, after the implementation of Phases 1-4 and the Brooks Street Improvements.

Route	Routing	Weekdays	Saturdays	Sundays and Holidays
Route 1	As in existing network. Between Downtown and Southgate Mall, via Arthur and South Avenue.	30-minute frequency from 6 am to 7 am, then 15-minute frequency until about 6 pm. 30-minute frequency from 6 to 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from about 9 am to about 11 pm.	60-minute frequency from about 9 am to about 11 pm.
Route 2	Between Downtown and Southgate Mall, via Spruce, Scott, Phillips, Russell, 3rd, and Johnson.	30-minute frequency from 6 am to 7 am, then 15-minute frequency until about 6 pm. 30-minute frequency from 6 to 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from about 9 am to about 11 pm.	60-minute frequency from about 9 am to about 11 pm.
Route 3	As in existing network. Begins and ends Downtown, via Spruce, Scott, Dickens, 5th, and Orange.	60-minute frequency from 6 am until about 9 pm, with some 30-minute frequency during the day.	60-minute frequency from about 9 am to about 9 pm.	60-minute frequency from about 9 am to 9 pm.
Route 4	As in existing network. Between Downtown and east of Bonner, via Broadway, Speedway, Staple, MT-200, Zaugg, Flagler, 1st, and MT-200.	60-minute frequency from about 6 am to 9 pm.	60-minute frequency from about 9 am to about 9 pm.	No service
Route 5	Between downtown and Upper Rattlesnake, via Broadway, Van Buren, and Rattlesnake.	60-minute frequency from about 6 am to 9 pm.	60-minute frequency from about 9 am to about 9 pm.	60-minute frequency from about 9 am to 9 pm.
Route 6	As in existing network. Between Downtown and the Community Hospital, via Higgins, South, Bancroft, Russell, Southgate Mall, and South Ave.	60-minute frequency from 6 am to 7 am, then 30-minute frequency until 6 pm, then 60-minute frequency until 10 pm.	60-minute frequency from about 9 am to about 10 pm.	60-minute frequency from about 9 am to about 10 pm.
Route 7	Northern half as in existing network; southern half simplified. Between Downtown and South 39th Street, via Orange, Stephens, Brooks, Southgate Mall, Brooks and Weeping Willow.	60-minute frequency from 6 am to 7 am, then 15-minute frequency until about 6 pm; 30-minute frequency until 8 pm; 60-minute frequency until 10 pm.	60-minute frequency from about 9 am to about 10 pm.	60-minute frequency from about 9 am to about 10 pm.
Route 8	Similar to existing network, with different downtown routing. Between Downtown and Community Hospital, via Madison Street Bridge, 5th and 6th, Catlin, 10th, Eaton, and Southgate Mall.	30-minute frequency from 7 am to 9 am. 60-minute frequency from 6 am to 7 am, and then from 9 am to about 9 pm.	60-minute frequency from about 9 am to about 9 pm.	No service
Route 9	Between Downtown and Community Hospital, via Orange, 3rd, Hiberta, Spurgin, Clements, and South.	60-minute frequency during rush hours (about 7 am to 10 am, and 3 pm to 6 pm).	No service.	No service
Route 11	Between Downtown and the airport, via Spruce, Phillips, Russell, Railroad, and Expressway.	60-minute frequency from about 6 am to 9 pm.	60-minute frequency from about 9 am to about 9 pm.	60-minute frequency from about 9 am to 9 pm.
Route 12	As in existing network. Between Downtown and 55th Street, via Arthur, South, Higgins, Whitaker, 39th, Gharrett, 55th, and 23rd.	30-minute frequency during rush hours (6 am to 9 am, and from 4 pm to 6 pm). 60-minute frequency during the midday and until 9 pm.	60-minute frequency from about 9 am to about 9 pm.	60-minute frequency from about 9 am to 9 pm.
Route 15	Between Downtown and Connery, via Broadway, Palmer, and Union Pacific.	30-minute frequency from 6 am to 7 am, then 15-minute frequency until about 6 pm. 30-minute frequency from 6 to 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from about 9 am to about 11 pm.	60-minute frequency from about 9 am to about 11 pm.

Appendix H: Long-Term Network Routing, Frequencies & Hours of Service

This table details the Long-Term Network's Routing, Frequencies and Hours of Service

Route	Routing	Weekdays	Saturdays	Sundays and Holidays
Route 1, 1A, and 1B	Trunk begins downtown, travels via Broadway and Arthur. 1A continues along South to Community Hospital. 1B, from Arthur, turns down Higgins, travels via Whitaker, 39th, and loops on Gharrett, 55th, and 23rd.	Trunk: 15-minute frequency from 6 am to 7 am, then 7.5-minute frequency until 6 pm. 30-minute frequency from 6 pm to 8 pm, then 60-minute frequency until 11 pm. 1A branch: 30-minute frequency from 6 am to 7 am; 15-minute frequency until 6 pm; 30-minute frequency until 8 pm; 60-minute frequency until 11 pm. 1B branch: 30-minute frequency from 6 am to 9 am, and from 4 pm to 6 pm. 60-minute frequency from 9 am to 4 pm, and from 6 pm to 9 pm.	Trunk and 1A branch: 60-minute frequency from 9 am to 10 am, then 30-minute frequency until 6 pm. 60-minute frequency resumes until 11 pm. 1B branch: 60-minute frequency from 9 am until about 9 pm.	Trunk and 1A branch: 60-minute frequency from about 9 am to about 11 pm. 1B branch: 60-minute frequency from about 9 am to 9 pm.
Route 2	Between Downtown and the intersection of Higgins and Russell, via Spruce, Phillips, and Russell.	30-minute frequency from 6 am to 7 am; 15-minute frequency until 6 pm; 30-minute frequency until 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency until 6 pm; 60-minute frequency until 11 pm.	60-minute frequency from about 9 am to about 11 pm.
Route 4 and 4A	4: Between Downtown and east Missoula, via Broadway, Speedway, and Staple. 4A continues past Bonner, via MT-200, Zaugg, Flagler, 1st, and MT-200	4: 60-minute frequency from 6 am to 7 am, and from 6 pm to 9 pm. 30-minute frequency from 7 am until 6 pm. 4A: 60-minute frequency from about 6 am until 9 pm.	4: 60-minute frequency from 9 am to 10 am, and from 6 pm to 10 pm. 30-minute frequency from 10 am until 6 pm. 4A: 60-minute frequency from about 9 am to about 9 pm.	4A: 60-minute frequency from about 9 am to 9 pm. Route 4 service runs one hour longer until 10 pm at 60-minute frequency.
Route 5	Between downtown and Upper Rattlesnake, via Broadway, Van Buren, and Rattlesnake.	60-minute frequency from about 6 am to 9 pm.	60-minute frequency from about 9 am to about 9 pm.	60-minute frequency from about 9 am to about 9 pm.
Route 6	Between downtown and the intersection of 55th and 23rd, via Higgins, South, Bancroft, and Hillview.	60-minute frequency from about 6 am to 7 am, and 6 pm to 10 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency from 10 am until 6 pm; 60-minute frequency from 6 pm to 10 pm.	60-minute frequency from about 9 am to 10 pm.
Route 7	Between Downtown and South 39th Street, via Higgins and Brooks.	30-minute frequency from 6 am to 7 am; 15-minute frequency until 6 pm; 30-minute frequency until 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency until 6 pm; 60-minute frequency until 11 pm.	60-minute frequency from about 9 am to about 10 pm.
Route 9	Between Downtown and the Community Hospital, via Orange, 3rd, Hiberta, Spurgin, Clements, and South.	60-minute frequency during rush hours (about 7 am to 10 am, and 3 pm to 6 pm).	No service.	No service.
Route 15	Between Downtown and the intersection of Connery and England, via Broadway, Palmer, and Union Pacific	30-minute frequency from 6 am to 7 am; 15-minute frequency until 6 pm; 30-minute frequency until 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency until 6 pm; 60-minute frequency until 11 pm.	60-minute frequency from about 9 am to about 10 pm.
Route 16	Between Downtown and South 39th Street, via Spruce, Phillips, Russell, American, and Reserve.	60-minute frequency from about 6 am until 9 pm.	60-minute frequency from about 9 am until 9 pm.	60-minute frequency from about 9 am until 9 pm.
Route 17	Between Downtown and the airport, via Orange, 5th, a new road, and Expressway.	60-minute frequency from 6 am to 7 am. 30-minute frequency from 7 am until 6 pm. 60-minute frequency from 6 pm until about 9 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency until 6 pm; 60-minute frequency until 10 pm.	60-minute frequency from about 9 am to 10 pm.

Table Continued: Long-Term Network's Routing, Frequencies and Hours of Service

Route	Routing	Weekdays	Saturdays	Sundays and Holidays
Route 18	Between the University and the intersection of Russell and 3rd, via 6th and Russell.	30-minute frequency from 6 am to 7 am; 15-minute frequency from 7 am until 6 pm; 30-minute frequency from 6 pm until 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency from 10 am until 6 pm; 60-minute frequency until 11 pm.	60-minute frequency from about 9 am to 11 pm.
Route 19	Between Downtown and Southgate Mall, via Orange, Wyoming, and Johnson.	30-minute frequency from 6 am to 7 am; 15-minute frequency from 7 am until 6 pm; 30-minute frequency from 6 pm until 8 pm, then 60-minute frequency until about 11 pm.	60-minute frequency from 9 am to 10 am; 30-minute frequency from 10 am until 6 pm; 60-minute frequency until 11 pm.	60-minute frequency from about 9 am to 11 pm.

Appendix G: Primary Transit Network Routing Description

The following is a list of the primary transit routes shown in the map of the Long-Term Network:

- Between Downtown and Community Hospital, via Broadway, Madison Street Bridge, Arthur, and South Avenue.
- Between Downtown and South 39th Street, via Higgins and Brooks.
- Between Downtown and Southgate Mall, via Orange, Wyoming, and Johnson.
- Between Downtown and the intersection of Connery and England, via Broadway, Palmer, and Union Pacific.
- Between Downtown and the intersection of Higgins and Russell, via Spruce, Phillips, and Russell.

The following is a list of other transit routes shown in the map of the Long-Term Network:

- Between the intersection of South and Higgins and the intersection of 55th and 23rd, via Higgins, Whitaker, 39th, Gharrett, and 55th.
- Between Downtown and the intersection of 55th and 23rd, via Higgins, South, Bancroft, and Hillview.
- Between Downtown and Community Hospital, via Orange, 3rd, Hiberta, Spurgin, Clements, and South Avenue.
- Between Downtown and the intersection of American and Reserve, via Spruce, Scott, Phillips, Russell, Railroad, Broadway, and American.
- Between Downtown and the airport, via Orange, 5th, Dickens, Scott, a new road, and Expressway.
- Between the intersection of Reserve and Expressway and an area west of England and north of George Elmer, via Reserve and England Boulevard.
- Between Downtown and Upper Rattlesnake, via Broadway, Van Buren, and Rattlesnake.
- Between Downtown and east of Bonner, via Broadway, Speedway, Staple, MT-200, Zaugg, Flagler, and MT-200.
- A route on Reserve Street (from American to 39th) is contingent on future growth and change to the design and operation of Reserve Street.